PRICE 50 CENTS

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

JANUARY 14, 1957

SHOCK . . . SUPERCOLD

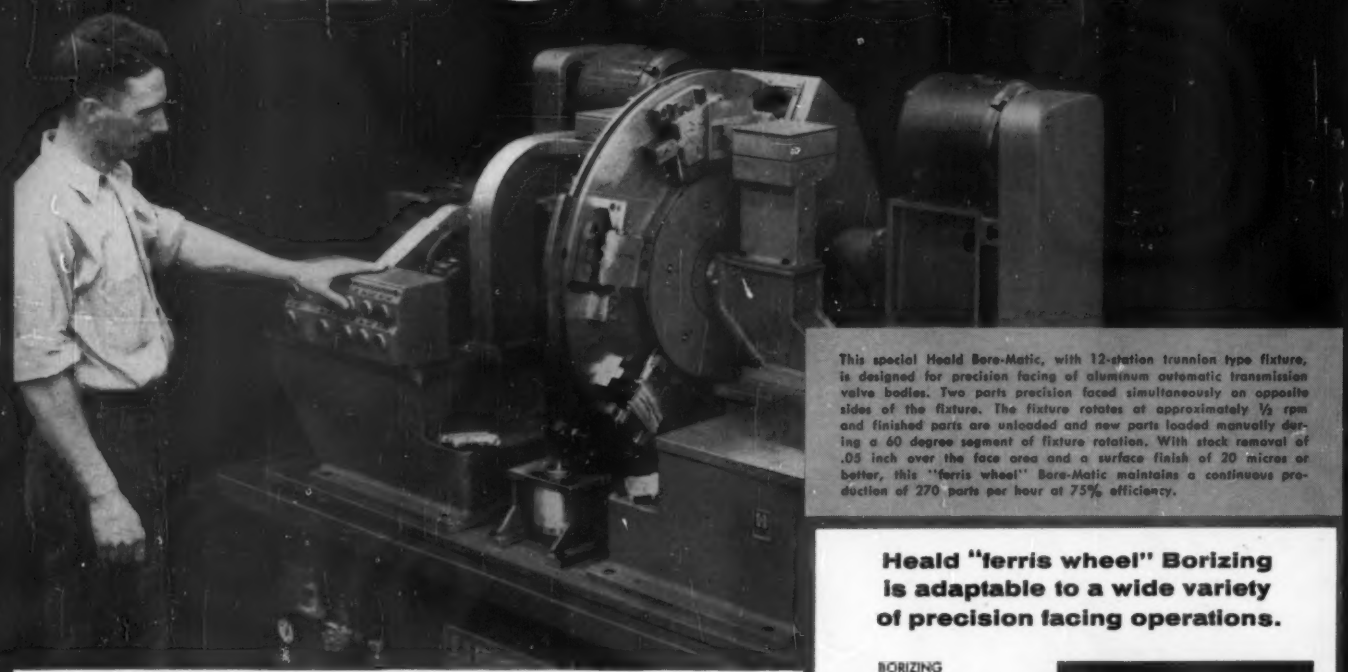
. . . startling ideas speed production

BUILDING THE SPACE SATELLITE

SUPERALLOYS ROUTED AT 2000 SFPM

A wide variety of hardened-steel parts are machined on old wood shapers at Boeing, with CO_2 as the coolant. At left, the job is heat-treated 4130 steel, and solid CO_2 storage tanks can be seen. Below is a more elaborate setup, with extension tables. Details inside

LET'S FACE IT!



This special Heald Bore-Matic, with 12-station trunnion type fixture, is designed for precision facing of aluminum automatic transmission valve bodies. Two parts precision faced simultaneously on opposite sides of the fixture. The fixture rotates at approximately ½ rpm and finished parts are unloaded and new parts loaded manually during a 60 degree segment of fixture rotation. With stock removal of .05 inch over the face area and a surface finish of 20 micros or better, this "ferris wheel" Bore-Matic maintains a continuous production of 270 parts per hour at 75% efficiency.

Heald "Ferris Wheel" Bore-Matics put precision facing on a non-stop, high production basis . . . with loading and unloading "on the fly"

WHEN it comes to *precision facing*, Heald Borizing, with a "ferris wheel" type fixture, meets the most exacting requirements for both high production and high precision.

Designed for continuous operation, with non-stop loading and unloading, a multi-station rotating trunnion-type fixture carries the parts between two opposed boringheads which perform simultaneous facing operations on both sides of the fixture.

The loading and unloading are done while the fixture is rotating at a constant speed and can be accomplished easily by manual operation as in the photo above. A foot operated hydraulic clamping control leaves both hands free for this operation.

This specialized precision facing machine illustrates the extreme flexibility of Bore-Matic design and the ability of Heald engineering to solve your precision finishing problems with the most advanced production methods.

IT PAYS TO COME TO HEALD!

HEALD

THE HEALD MACHINE COMPANY

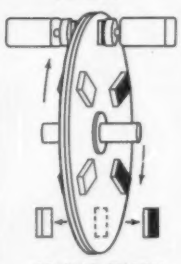
Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

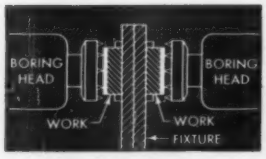
Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

Heald "ferris wheel" Borizing is adaptable to a wide variety of precision facing operations.

BORIZING

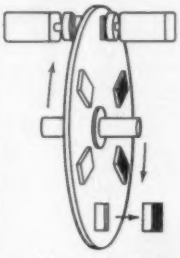


LOADING STATION



FACING ONE SIDE OF TWO PARTS SIMULTANEOUSLY

BORIZING



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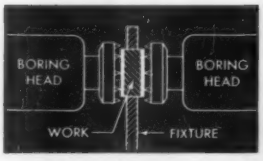
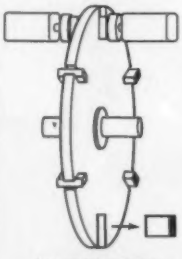


FACING BOTH SIDES OF ONE PART SIMULTANEOUSLY

BORIZING



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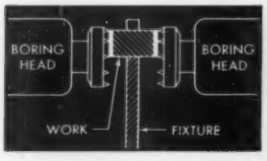

FACING BOTH ENDS OF ONE PART SIMULTANEOUSLY

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

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American Machinist *Chips*

Cover . . .
Routing at 2000 sfpm on converted wood shapers at Boeing with CO_2 as a coolant. For details of the process, see the article on page 107.

Shock forming . . . Gunpowder and stronger explosives show real promise in punching, upsetting, forming, expanding, swaging, cupping, bulging, and other operations on difficult materials because they move the metal before it has time to crack.

The earliest example of shock energy harnessed for such an application was probably the Temple gun (described in *American Machinist* 17 years ago), which utilized blank shotgun shells to drive studs into ship plates under water. But in recent years there has been a rapid expansion of cartridge-actuated devices and we are learning other ways to harness shock energy. In this issue, we provide a 3-part package on the subject that includes a roundup of experiments to date, a summary of the work at Lockheed, and a discussion of the theory behind the practice. The first detonation is on page 110, and the other two follow immediately behind it.

Satellite Story . . . The launching of the first space satellites during the International Geophysical Year (which starts next summer) is opening new areas in many fields of science and engineering. We knew you would want the production details on the satellite itself, so we've been looking over shoulders at Brooks & Perkins since we first learned that they would build the actual space vehicle. Fabrication is well along now and you will find the first production details on page 101.

No punches pulled . . . With a dollars and sense approach, the Rotor Tool Co has been able to save money by putting small-lot production on high-production machine tools. In our Special Report, H P Bailey, president, provides an unusually frank account of the problems of a small plant in equipment selection. His report is documented with nine case studies of completed projects and five others that are under consideration. A simple analysis without formulas is one of the many pointers you can pick up from a study of this report. You'll also learn a lot about the effect of reduced lot size, the value of old equipment, ways to compare various processes and machines, and to avoid too-fast write-off. We recommend it highly. See page 117.

Coming . . . *AM* for Jan 28 will be our 1957 Production Preview Issue. It will contain our popular annual summary of the new equipment, materials, and parts introduced during the past year—the material you'll be using during this new year. There has been a larger-than-usual number of items this past year, so this classified summary will be of greater utility than ever.

Sam K Wood . . . senior associate of Wells & Associates, has pioneered in the statistical work-sampling technique, applying it to direct and indirect labor with equal success. He is the author of the article (page 138) on how to set screw-machine standards. Mr Wood has more than 20 years experience as a consultant. During World War II he was chief of the Precision Tool Gage and Measuring Instruments Section of the War Production Board

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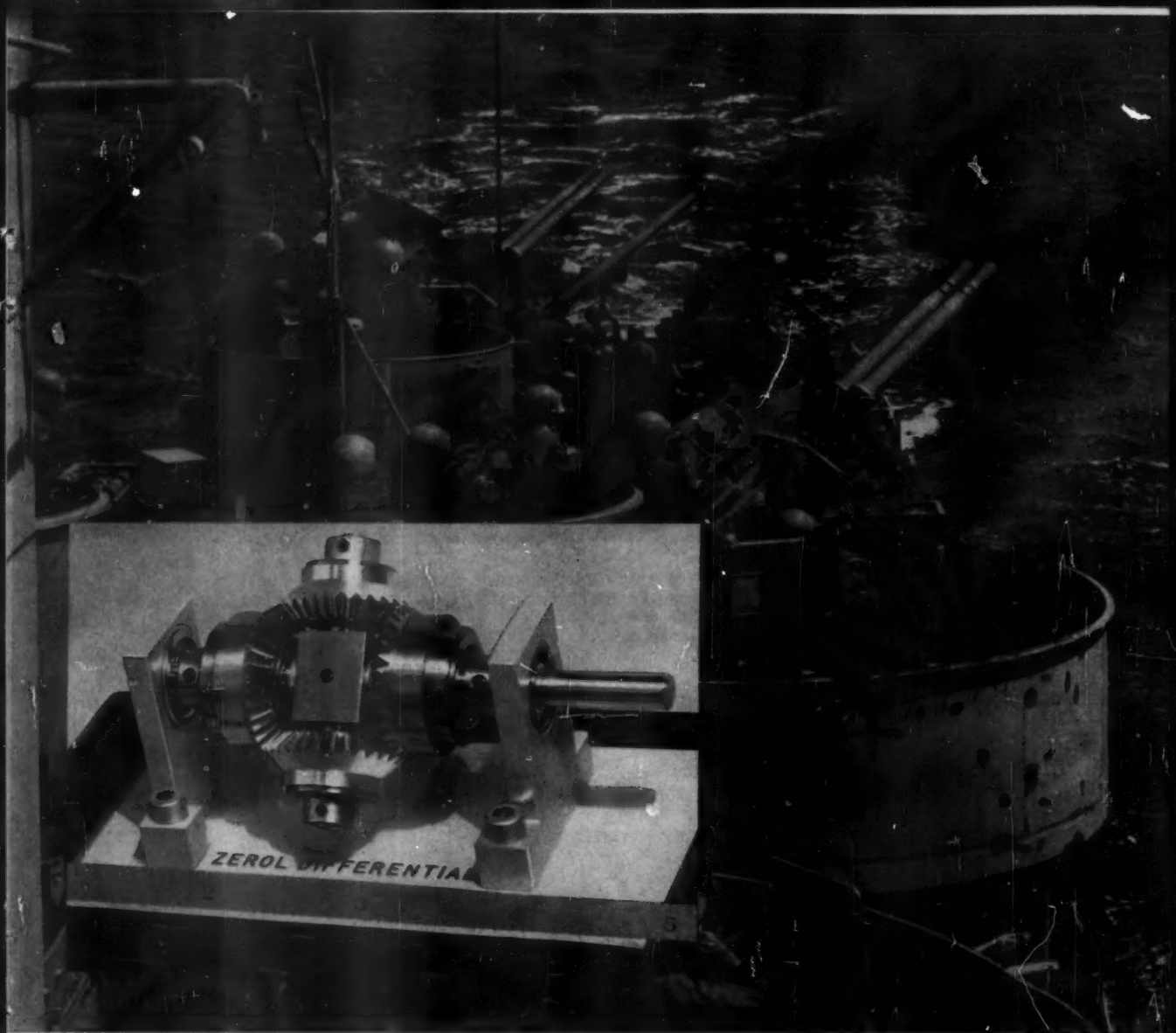


Official United States Navy Photograph

When your fine pitch gears *must be accurate*

When you work with fine pitch gears like those in this naval fire control unit differential, tolerances are critical.

Tooth-to-tooth accuracy is extremely important to permit the guns to be sighted precisely on target.

So where accuracy is really critical in the gears you make, Gleason can help you three ways:

1. Machines that cut or grind any fine pitch gear

You can produce any fine pitch gear—spiral bevel, hypoid, Zerol®, or Coniflex®—exactly and economically with any of five Gleason machines.

Three automatic gear-cutting generators cover the entire field of cut fine pitch bevel gears up to 4½" diameter. Two automatic, wet-type grinders are available for this same range of work and produce the ultimate in accuracy. All five work to your most rigid specifications.

2. Machines that test gears thoroughly

The Gleason No. 104 Hypoid Tester, for example, checks running qualities, tooth spacing, and concentricity of gears. It records test results on paper so that you have a permanent record of the total tooth-to-tooth composite error.

3. Engineering services

Gleason engineers are ready at all times to help you with any phase of the design and manufacture of fine pitch gears.

Simply write or phone for prompt assistance on any of your fine pitch gear requirements.

Send for these bulletins:

No. 2A Straight Bevel Coniflex® Generator
No. 103 Straight Bevel Coniflex® Generator
No. 2 Hypoid Generator
No. 105 Straight Bevel Coniflex® Grinder
No. 7 Hypoid Grinder
No. 104 Hypoid Tester

GLEASON WORKS

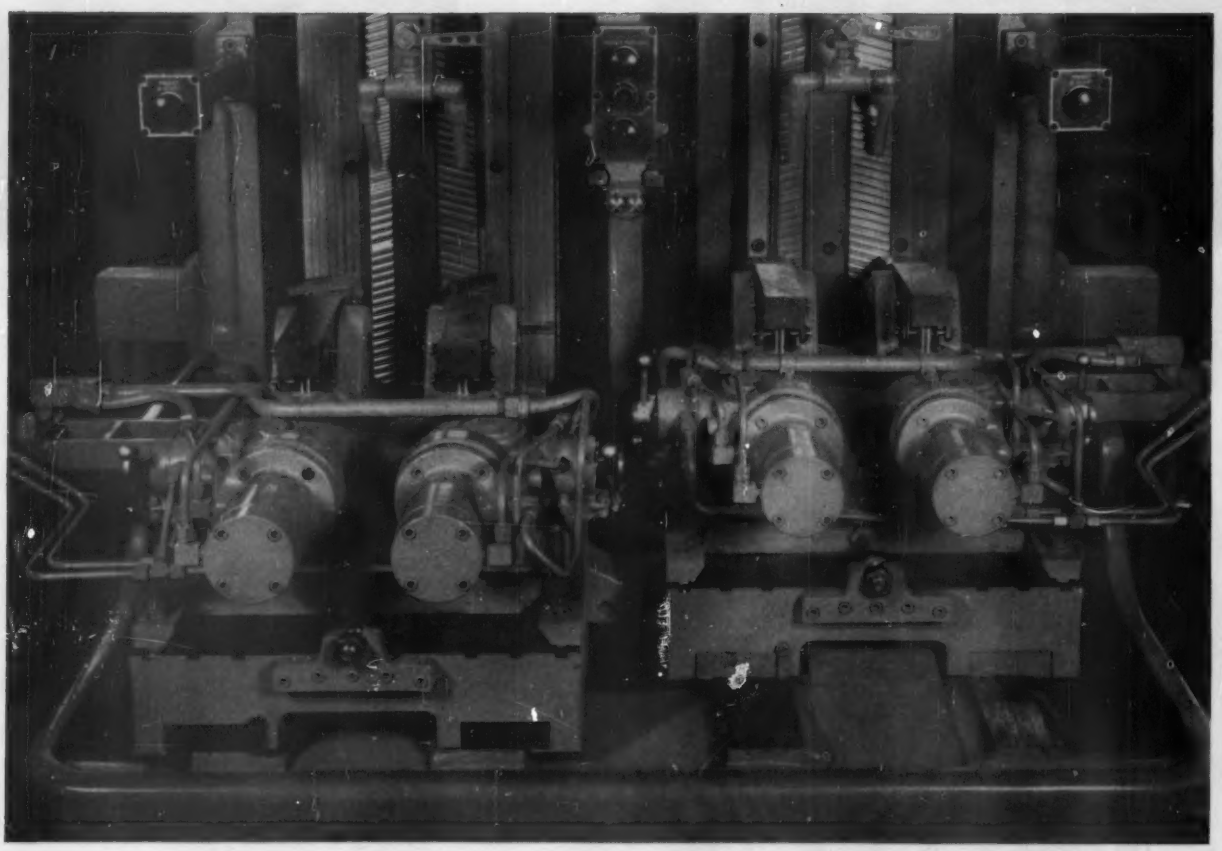
Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N. Y.

Two tool [illegible] clamped in position, as seen by the broaching cutters. The top relief will be broached on one of these blanks and the side relief on the other.

Two Broach in 65%

CINCINNATI



Cincinnatis

134 SIZES of Tool Bits

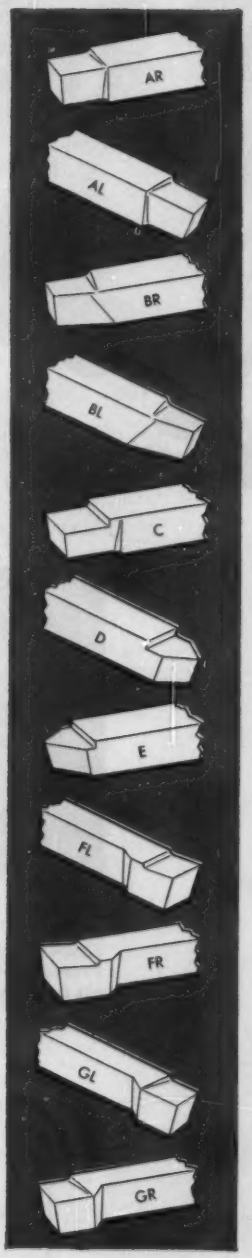
Less Floor Space

Doing more work in a smaller area releases valuable floor space for other productive equipment; reduces fixed cost. Two CINCINNATI® Hydro-Broach Machines save 65% of the floor space formerly required by the old equipment to machine 11 styles of tool bits in 134 sizes. These two Hydro-Broach machines, both of 10-ton capacity, were tooled up by Cincinnati broaching specialists with hydraulically operated, progressive type fixtures. All tool bits, a few of which are illustrated at the right, are broached complete from a common shape of blank.

This Cincinnati two-machine production team averages 800 completely broached parts per hour.

You may not be directly interested in the manufacture of tool bits, but you will be interested in what CINCINNATI Broaching Machines and Engineering Service can do to reduce your manufacturing costs (and perhaps fixed costs, too). May we hear from you? Meanwhile, you might want a copy of our latest Duplex Hydro-Broach catalog. Brief specs will be found in Sweet's.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO



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MILLING MACHINES • BROACHING MACHINES • CUTTER AND TOOL GRINDERS • METAL FORMING MACHINES
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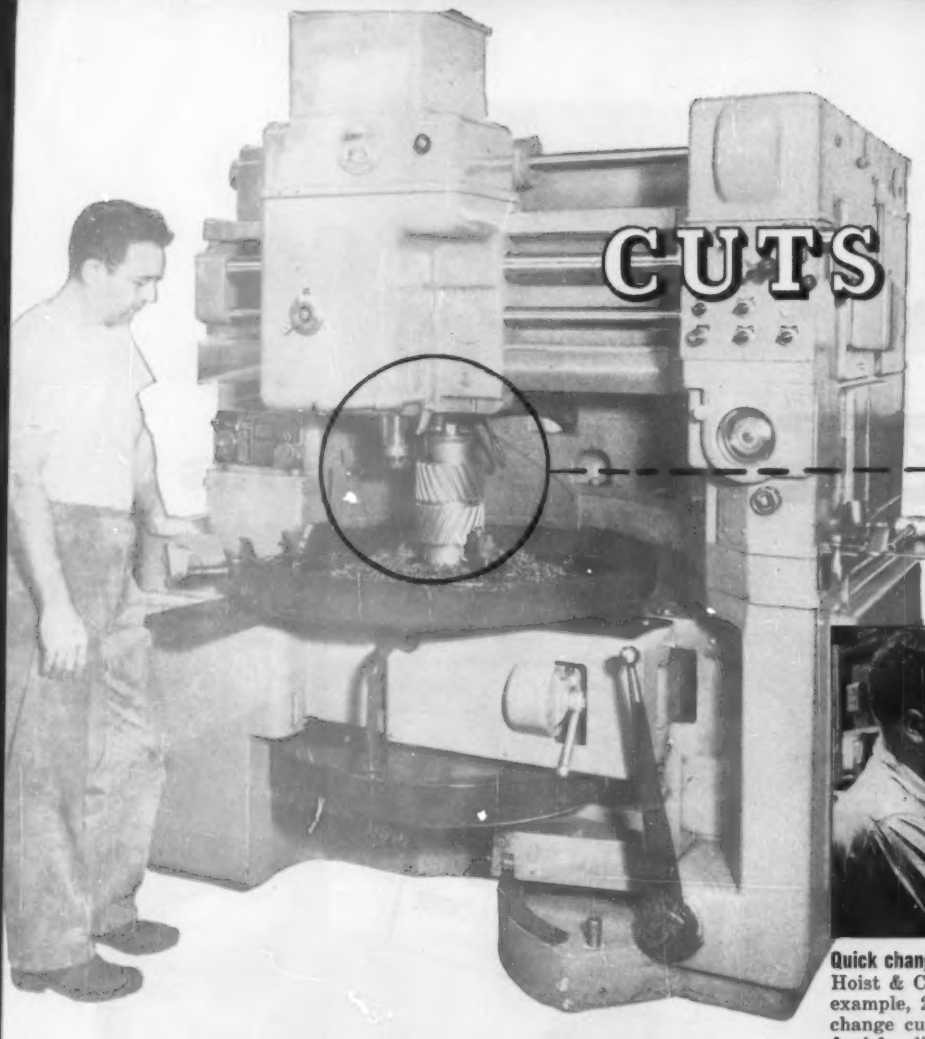
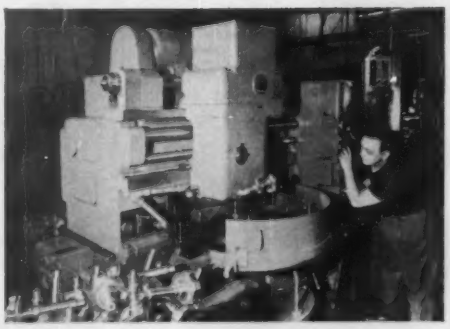
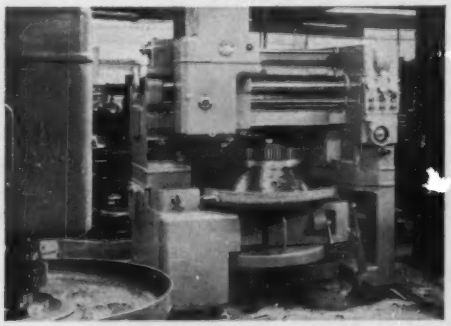
CUTS COSTS



Quick change cuts costs on short runs: at Silent Hoist & Crane Company, Brooklyn, N. Y., for example, 25 seconds is all the time needed to change cutter speed, depth of cut and rotary feed for different sized sprockets.



Five times faster than the machines they replaced on a variety of jobs, 36-Type Gear Shapers set many cost-cutting records at New Process Gear Co., Syracuse, N. Y. Part shown cut in one operation. Rate: 135 finished per day.

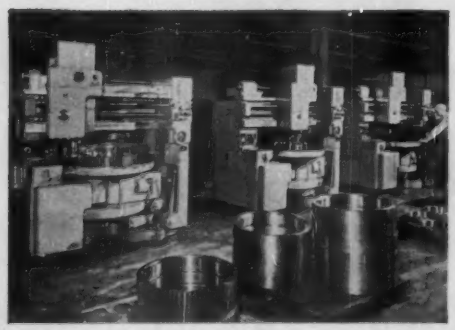


Faster on gears up to 36" P.D., two 36-Type machines replaced *five* older machines at Samuel M. Langston Co., Camden, N. J. 22.250" P.D., 4 D.P. steel spur shown is cut in 2½ hours. Production time on previous machine—10 hours.

THE PRECISION LINE

5 WAYS

FELLOWS 36-TYPE GEAR SHAPER



Heavy cutting power: 36-Type Gear Shaper removes 93 cubic inches of stock (26 lbs.) from the blank in just two cuts to make this 25.3" P.D., 3 D.P. gear at Fairfield Manufacturing Co., Lafayette, Ind. Total time: 258 minutes.

More efficient small gear cutting, too: 57 minutes is all it takes to cut each hand of this 6.486" P.D., 5/7 D.P.; 23° H.A., herringbone pinion at Snow-Nabstedt Corporation, Hamden, Conn., on their 36-Type Gear Shapers.

Here's the way to lower gear production costs even though over-all costs keep rising! These major firms (and many others) have proved that fast, accurate Fellows 36-Type Gear Shapers have the power, speed and versatility to cut production costs . . . often by more than 50%!

Set-ups are fast and simple for a wide range of jobs up to 36" P.D. Cutter speeds from 18 to 300 strokes per minute are available through a selector dial. Four rotary feeds are available through a feed lever, additional feeds through two pick-off gears. Semi-automatic fixtures may be used to decrease loading time.

Whether for long runs or many varied jobs, the powerful, versatile Fellows 36-Type Gear Shaper can very probably lower *your* gear production costs. Your Fellows Representative can give you valuable facts and figures about the benefits of investing in the Fellows Precision Line of gear production equipment. Write, wire, or phone any Fellows office.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices: 1048 N. Woodward Ave., Royal Oak, Mich.
150 West Pleasant Avenue, Maywood, N. J.
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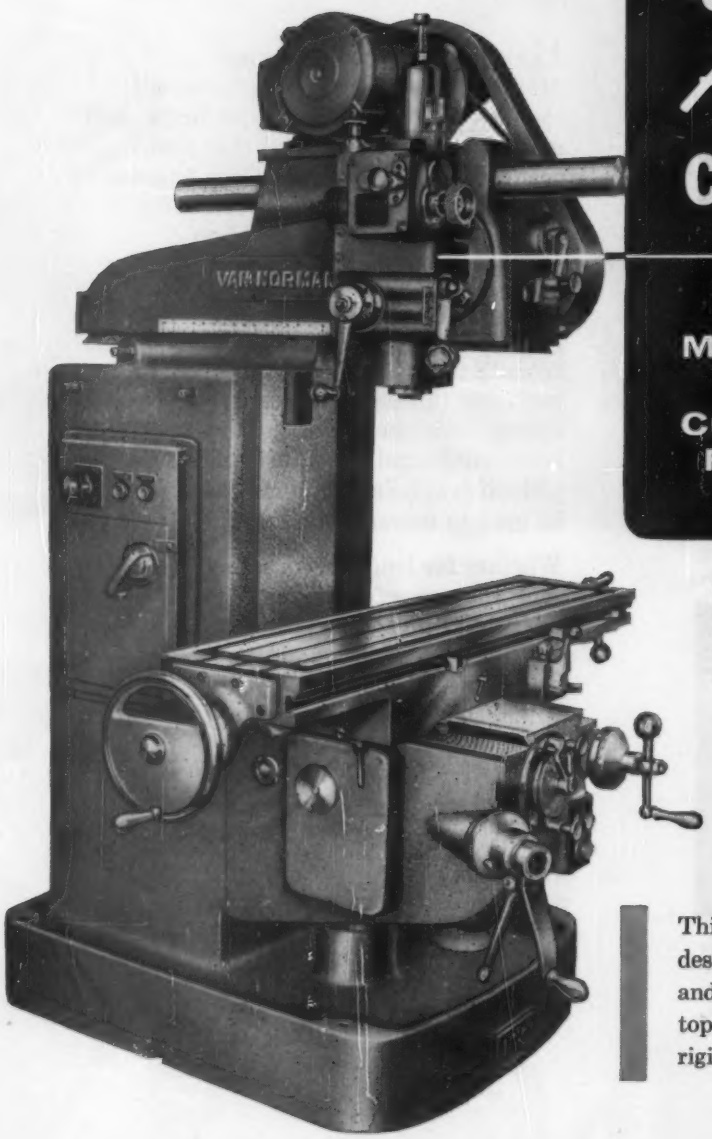
Fellows *Gear Production Equipment*

The VAN NORMAN

WITH THE QUILL-TYPE *Adjustable* CUTTERHEAD

Gives you
MORE VERSATILITY
PLUS MORE
Cutability than Single
Purpose Machines



No. 16S
Quill Travel: 4"
Quill Power Feed: .0015; .003; .006
22" Power feed to table
Cutterhead Spindle Motor: 2 HP

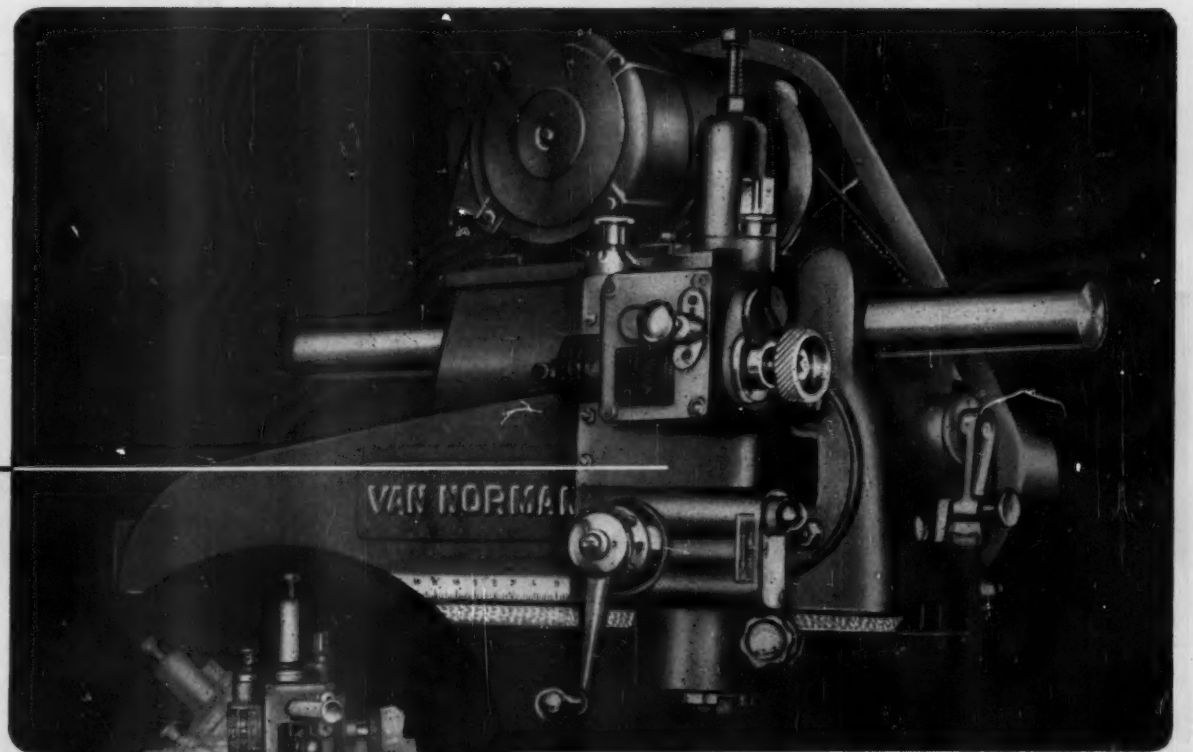
You can own this machine for as little as $4.98 per day

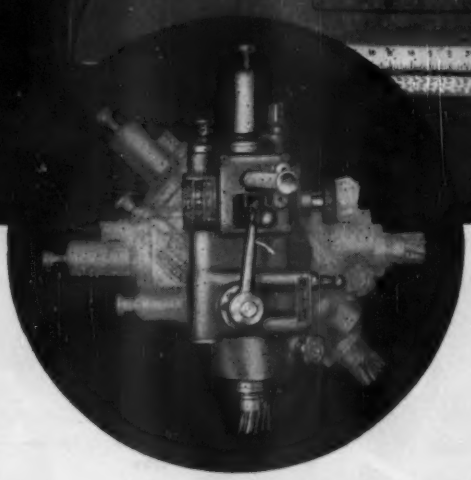
This new Van Norman Ram Type Miller is designed to increase your milling production and reduce milling costs. Entirely new from top to bottom, it is engineered for maximum rigidity, cutability and accuracy.

VAN NORMAN MACHINE

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

No. 16S Ram Type Miller





Quill-Type Adjustable Cutterhead Mounted on Rugged Heavy Duty Ram Gives You Horizontal, Angular and Vertical Milling PLUS Accurate Boring and Drilling on ONE Machine.

A single investment in this one miller gives you the equivalent of two single purpose machines plus attachments at the much lower cost of a single machine. It is available in both plain and universal models. *Write for complete details today.*

Don't wait . . . for extra profits install a Van Norman now! They are available on many purchase plans — Outright sale . . . Purchase on conditional sales contract up to 5 years . . . Pay as you depreciate . . . up to 10 years. See your dealer or write Van Norman Machine Company.

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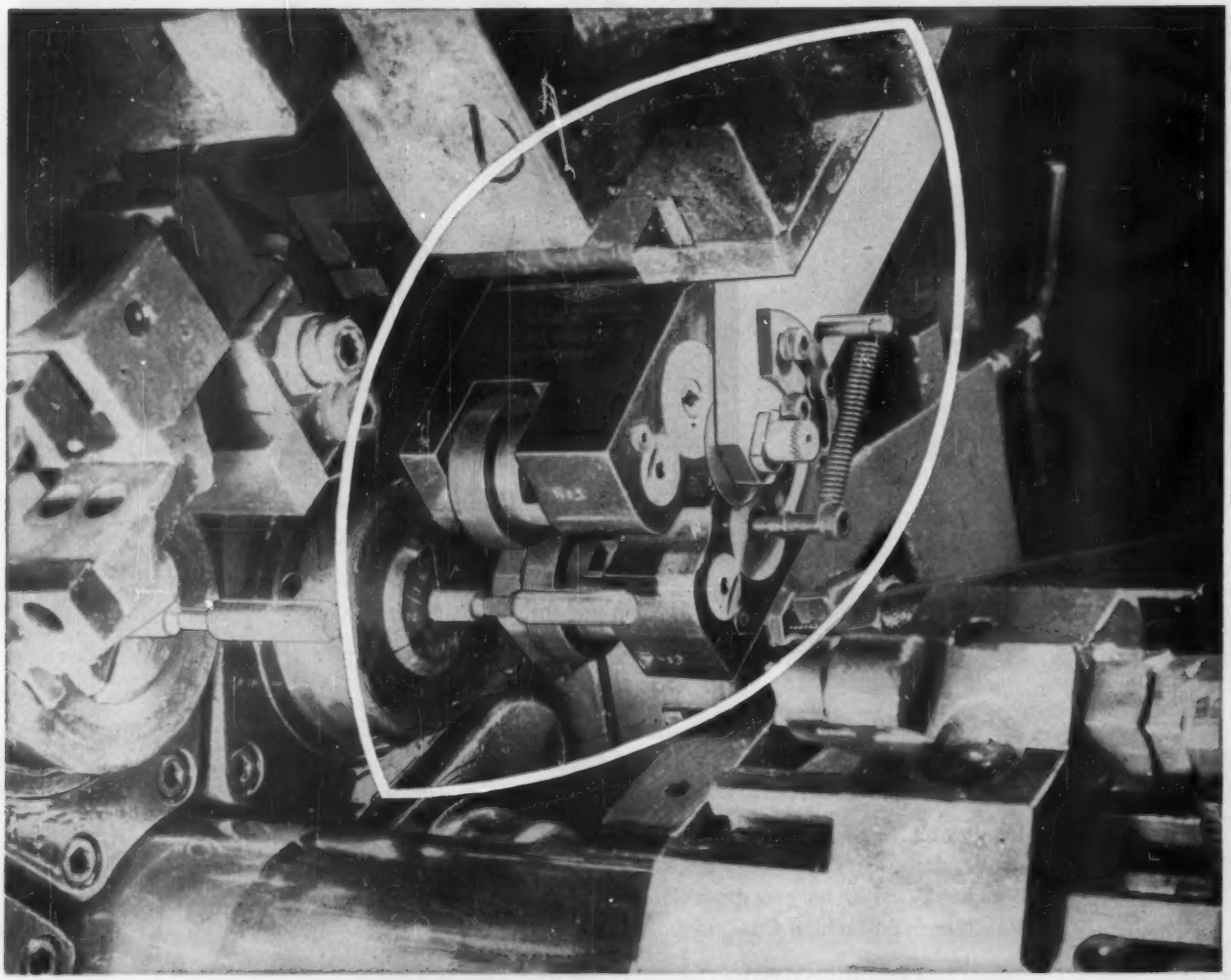
Write for complete details today.

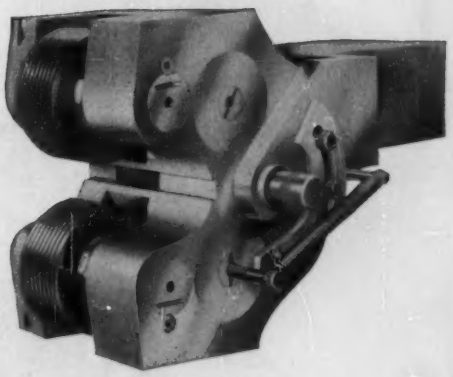
COMPANY | **SPRINGFIELD 7, MASSACHUSETTS**

Over 1,100,000 threads



THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT

with 1 set of Rolls



The economy of LANDIS Thread Rolling Attachments due to long roll life is being demonstrated in the production of studs at the M & S Morenci Corporation in Morenci, Michigan.

#10-32 pitch NF threads, .350" long, are rolled on 1020 screw stock using a #14 GA LANROLL Attachment on a 9/16" Acme-Gridley Automatic. The Attachment is operated in the 4th position, rolling next to the collet .030" back of the shoulder, and threads are held to ±.00025" on the pitch diameter. 1,100,000 threads have been produced to date with the original set of roll dies. Another Lanroll Attachment later placed in operation on the same job has to date produced 500,000 threads with its original rolls.

This long roll life is a result of the basic design of the Lanroll Attachment incorporating patented new principles. A degree of stabilization never before obtained in a tool of this type is ensured between the workpiece and the attachment. Open construction allows the use of thread rolls of the maximum diameter, distributing wear over an increased area. The accuracy and wear-resistance of the rolls themselves is the result of more than 50 years experience in the manufacture of threading tools. These rolls are precision-ground to produce uniform, accurate threads of the highest quality.

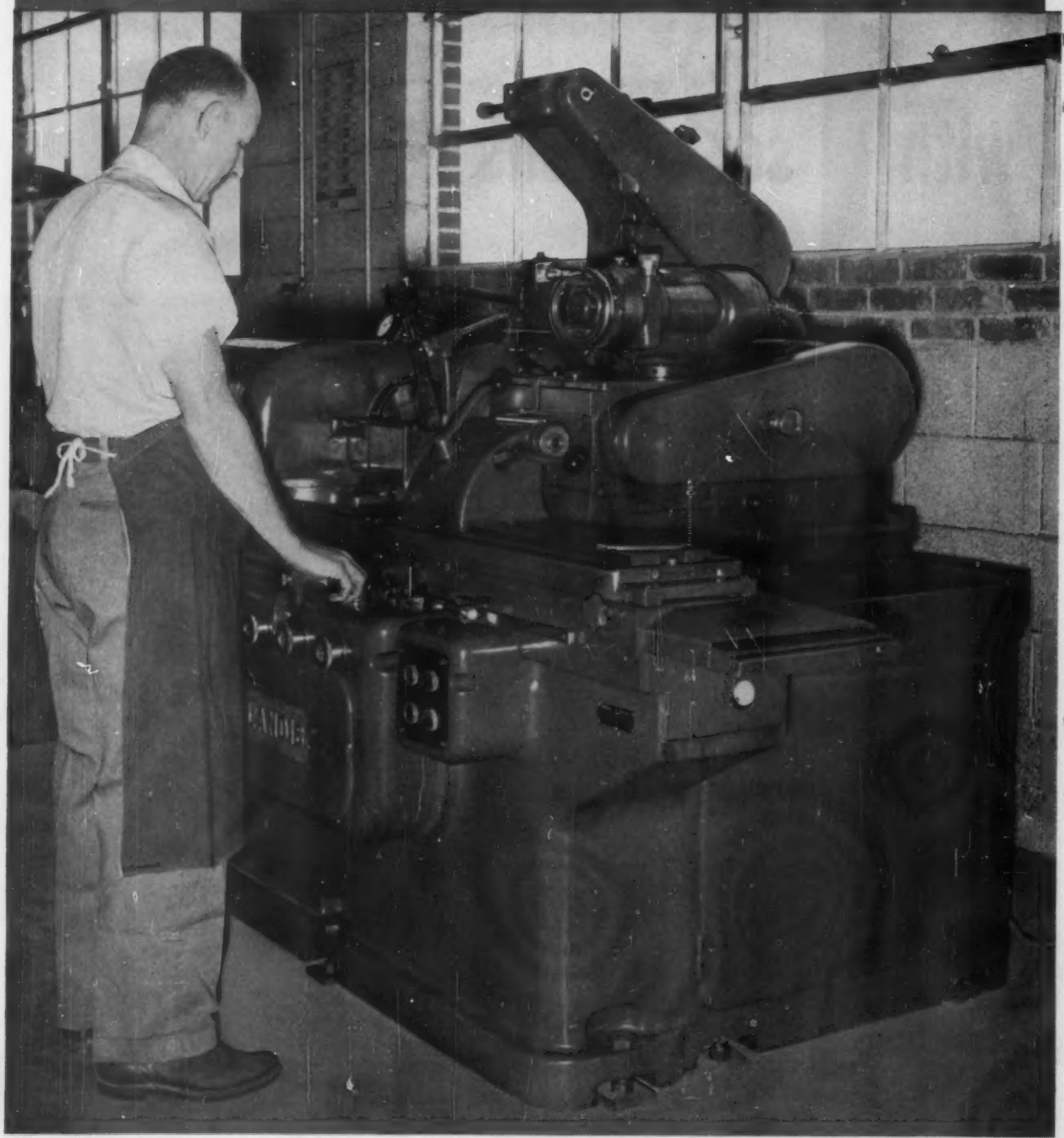
LANROLL Attachments are made in five sizes for use on bar automatics and turret lathes to roll both fine and coarse pitch threads to Class 4 tolerances. Quick and easy set-up changes assure operation of the attachment for every size within its range as though it were exclusively engineered for the particular work being threaded. The M & S operation shown here is an example of this set-up simplicity. Using only the handbook furnished with the Attachment, a satisfactory production set-up was made by a set-up man with no previous thread-rolling experience.

For more detailed information on construction and many exclusive features, send specifications and ask for Bulletin G-96.

LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA • U. S. A.

Landis universals save time for



10" x 24" Universal Cylindrical Grinder

LANDIS

precision grinders

toolrooms and small lot production

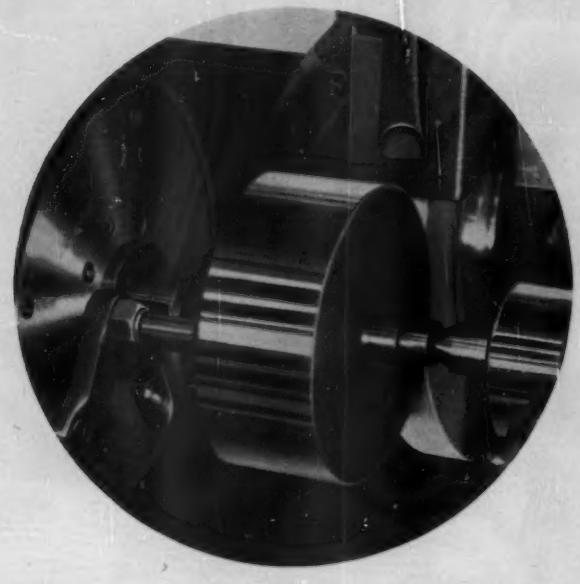
quick setups / hydraulic feeds

traverse grinding
infeed grinding
taper grinding
internal grinding
face grinding

condensed specifications

Maximum work swing	10¾"
Length between centers	24"
Diam. standard grinding wheel	12"
Wheel drive motor	1½ hp.
Work speed range	55 to 495 r.p.m.
Net weight, including elec. equip.	5,700 lbs.

Time saving internal grinding fixture of swinging bracket type gives quick changeover, from external to internal grinding.



Rigid construction gives fine finishes. Roll above was ground to 2 microinch finish.

Quick setup and operator convenience are assured through grouped controls at operator's position.

LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

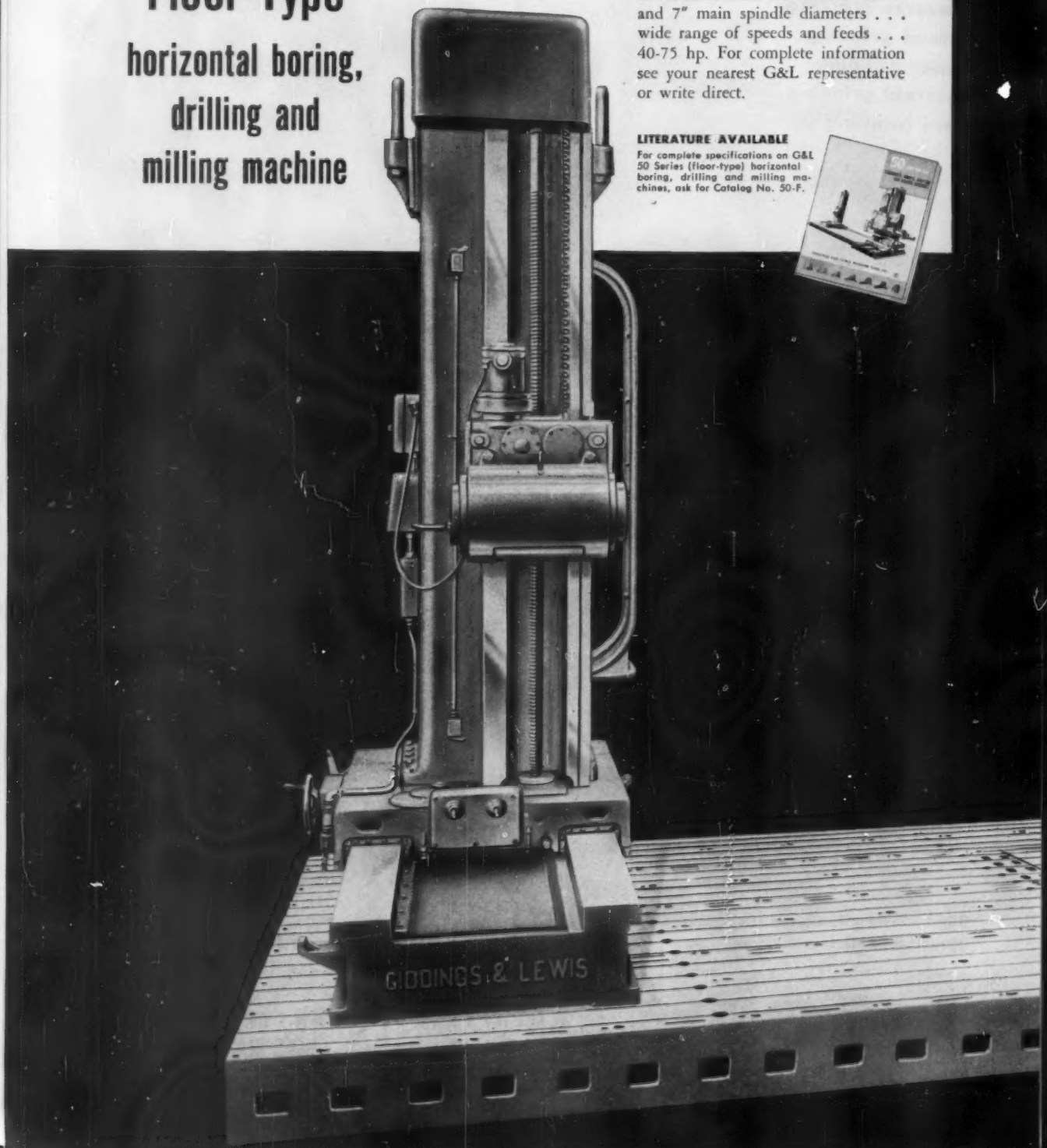
GIDDINGS & LEWIS MODEL 570-FUAR Floor-Type

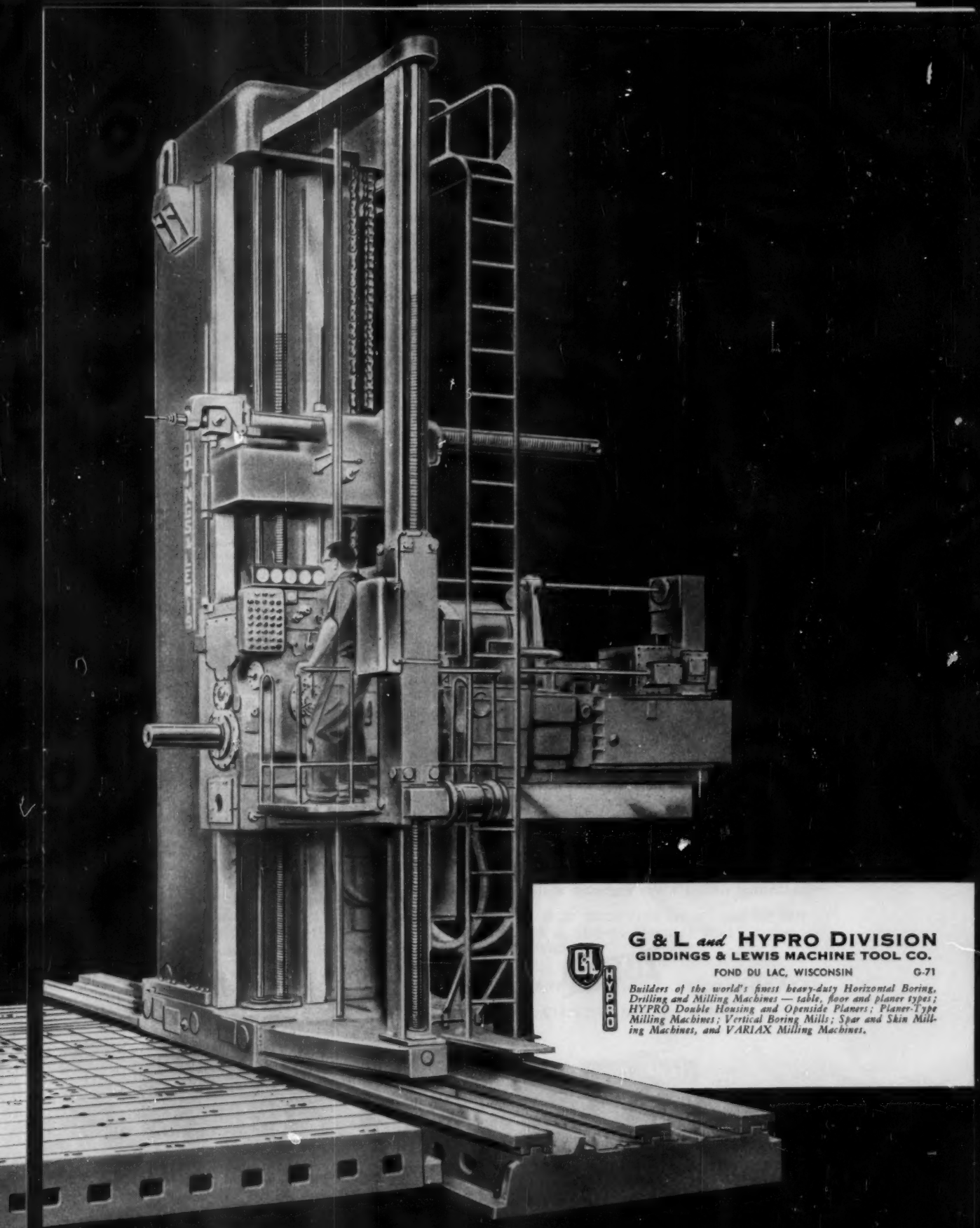
horizontal boring, drilling and milling machine

Power, speed, precision — best describe this modern G&L Model 570-FUAR Floor-Type horizontal with floor plate arrangement, built-in power elevator for operator and end support. Machine also features G&L *Dupli-Tracer* control and heavy-duty underarm for mounting spindle support, angular milling attachment, continuous feed facing and boring head and other time-saving accessories. 50 Series horizontals are offered with 6" and 7" main spindle diameters . . . wide range of speeds and feeds . . . 40-75 hp. For complete information see your nearest G&L representative or write direct.

LITERATURE AVAILABLE

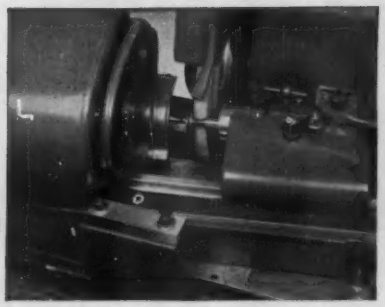
For complete specifications on G&L 50 Series (floor-type) horizontal boring, drilling and milling machines, ask for Catalog No. 50-F.





G & L *and* HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN G-71

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines, and VARIAX Milling Machines.



A short, short part . . . grinding the back face and shoulder of nozzles, 83 per hour, with the aid of a special holding device. This 4" Plain Hydraulic Grinder handles other operations, too.

How to
of Grinding

CINCINNATI FILMATIC 4" Plain Hydraulic Grinding Machine. Complete specifications may be obtained by writing for catalog No. G-551-2.

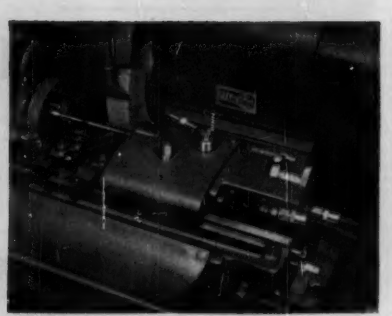
FILMATIC

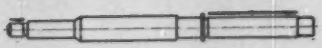
CIN

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES

Crankshafts with .050" throw ground from the solid. Cincinnati Application Engineers tooled up a 4" Plain Hydraulic for this job with a work holding fixture featuring repetitive stopping for convenience in loading.

Micrometer barrels, 200 per hour, grinding diameter and bevel simultaneously. This 4" Plain Hydraulic is equipped with work cradles, hydraulic footstock, automatic infeed, and a special table type profile wheel truing unit.





Armature shafts, grinding two diameters in two setups, 200 per hour per diameter. Laboraiding equipment for the 4" Plain Hydraulic illustrated here consists of automatic infeed, hydraulic footstock, and work cradles.

Cut the Cost

Small Precision Parts

In general, the cost of machining operations on small parts should be very low. Four examples of how this goal is attained with CINCINNATI® FILMATIC 4" Plain Hydraulic Grinding Machines are illustrated here. All are typical parts, with standard tooling or slight alterations on the machine to attain the highest rate of production at the lowest cost and minimum physical effort. Read how CINCINNATI FILMATIC 4" Plain Hydraulics contribute to these desirable results.

1) FILMATIC grinding wheel spindle bearings require no adjusting or maintenance
2) The bed is recessed so workers may be seated, yet all operating elements are at their finger tips
3) Automatic Infeed Attachment controls the complete grinding cycle (extra equipment)

You may obtain more data by writing for literature, or look in Sweet's Machine Tool Catalog for brief specifications.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

CINNATI

CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

NEW Type U4 Norton Universal Grinders – 12"x36" and 12"x48" – feature unbeatable versatility . . .

Quick, Easy Set-Ups plus fast grinding action enable this new Norton 12" grinder to cut time and costs in a wide variety of external, internal, face and angular wheel feed grinding jobs. Here the internal grinding spindle is shown swung up and out of the way while a shaft is being ground.

Permanent Chuck Mounting is an outstanding advantage. Headstock spindle has a dog drive plate on one end. On the other is a 5" D-1 cam lock nose, on which you can leave a chuck mounted permanently — merely swiveling headstock 180° to start chucking jobs faster.

do more jobs ... save more $$$

Greatly simplified set-ups give you more time for grinding

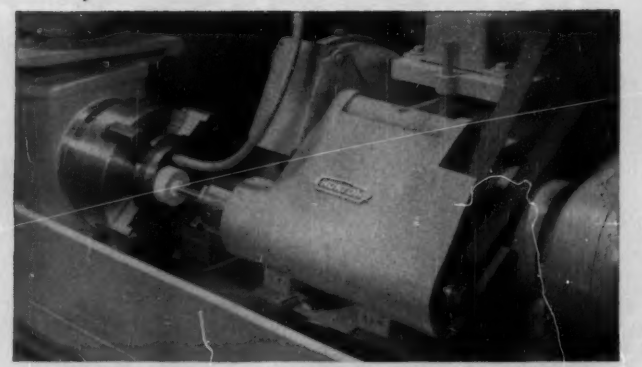
Double-barreled good news! The new Norton universal grinders are made in 12″ x 36″ and 12″ x 48″ work capacities!

Versatility keynotes the design, with feature after feature increasing the job range and cutting operating costs. For example, take the work speed range of 40 to 400 r.p.m. You get an infinite number of speeds over this wide range, simply by turning a dial.

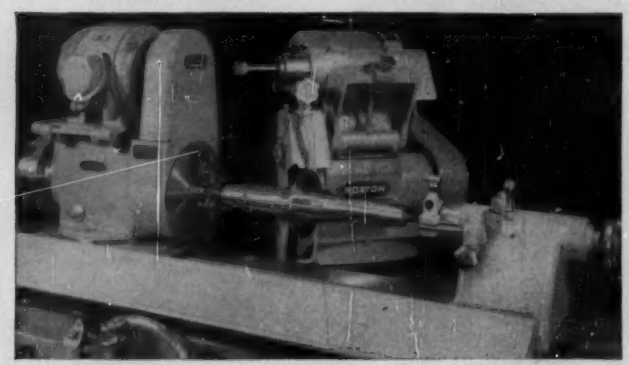
Other important features are illustrated here. It will pay you to look them over carefully — and consider their advantages in your own production.

Get the whole story

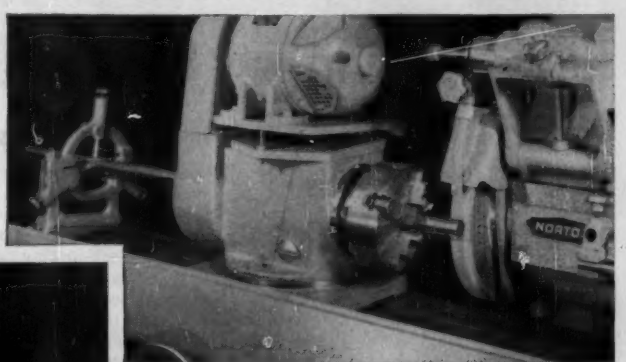
on the broad operational scope and fast, precision performance of these new Norton 12″ grinders. See your Norton Representative, or write us direct. And remember: only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.



For Quick Change-Over to or from internal grinding, the internal grinding spindle is permanently hinged to front of wheel slide. This also enables you to perform both internal and external grinding on a single workpiece without changing the set-up.



Settings At Any Angle are possible for both wheel and feed, independently, with this compound wheel head slide. Wheel head has swivels above and below the slide ways; upper wheel head member can be positioned to extend capacity when wheel head is swiveled.



Greater Shaft-Grinding Capacity is assured by the hollow spindle in the headstock. A 1¼″ hole clear through the headstock spindle permits passage of shafts that may be longer than the machine — another typical advancement that means greater versatility and usefulness.

12″ UNIVERSAL GRINDER — TYPE U-4. Fast grinding action for external, internal, face and angular wheelslide jobs. Permanent chuck mounting is one of many advanced features. Work lengths: 36″ and 48″. New SWIVALIGN Dual Electric Indicator shown measures swivel table adjustment — saves time and work. Also applicable to cylindrical grinders. Catalog 231 provides details.

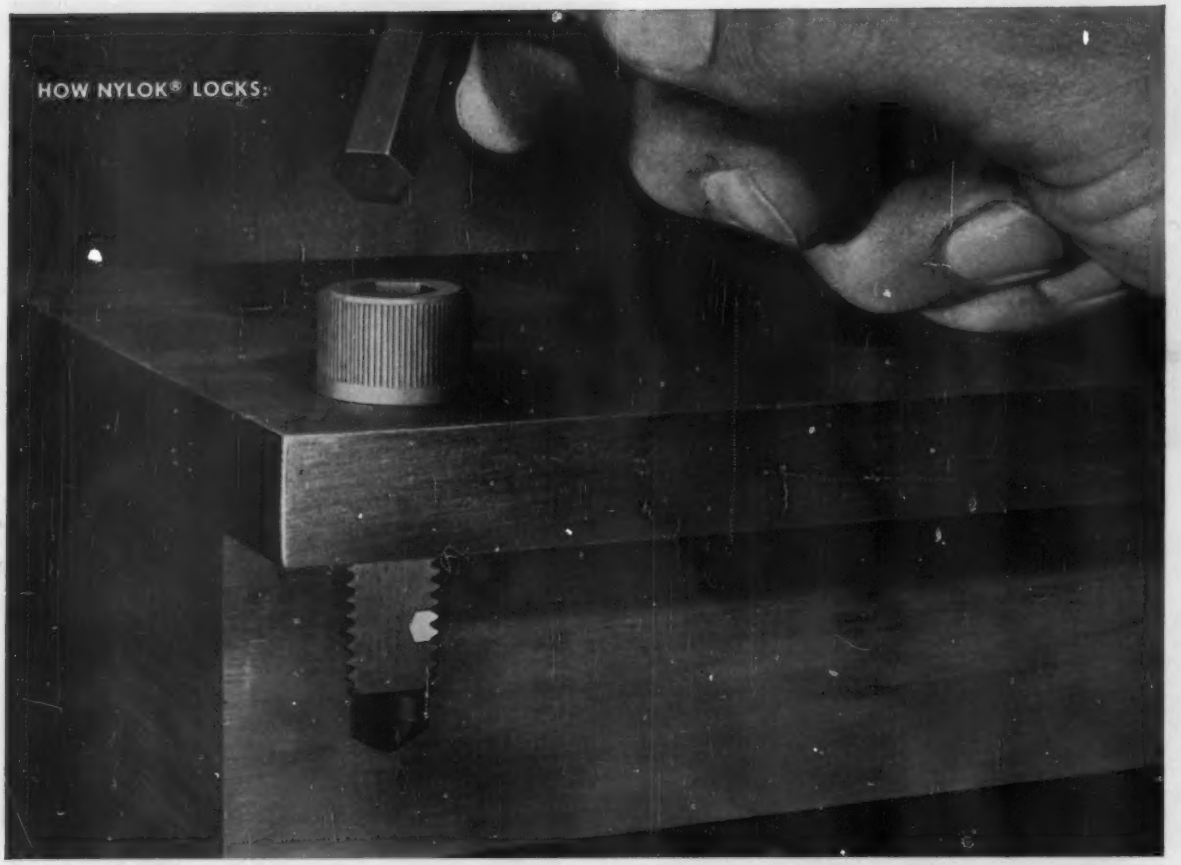
To Economize, Modernize With **NEW**

NORTON

GRINDERS and LAPPERS

Making better products ... to make other products better

District Sales Offices: Worcester • Hartford • New York
Cleveland • Chicago • Detroit



LOCKED! The tough, resilient nylon pellet keys itself into the mating threads. It forces threads together and locks the screw securely.

NEW—self-locking UNBRAKO socket head cap screws

Self-locking UNBRAKO socket head cap screw.

They won't work loose. And they simplify design and save production time.

UNBRAKO socket head cap screws are now available embodying the Nylok* self-locking principle. Nylok provides the first truly practical solution to the problem of making cap screws self-locking.

An UNBRAKO cap screw with Nylok is a single self-locking unit. No auxiliary locking devices are needed. Just thread the UNBRAKO into any tapped hole. *Seated or not*, it locks positively wherever wrenching stops. The tough, resilient nylon pellet forces mating threads together and holds tight. The screw will not work loose.

You save production time when you make products with self-locking UNBRAKOS. And you get greater simplicity in design with less bulk and weight. The number of parts you must assemble to achieve full locking action is reduced to the absolute minimum. Lockwashers under screw heads are no longer necessary. Costly wiring of cross drilled heads is eliminated. And in many cases you will save weight and mass by using shorter screws in tapped holes instead of drilling through and using nuts and lockwashers.

Self-locking UNBRAKOS are reusable. They have uniform locking and installation torques—with no galling or seizing on mating threads. They successfully withstand temperatures from —70° to 250°F. And, when screws are properly seated, the locking pellet also functions as a liquid seal.

A complete line of self-locking UNBRAKO socket screw products, in a wide range of standard sizes, materials and finishes, is available through your authorized industrial distributor. Technical data and specifications are detailed in Bulletin 2193. Write us for your copy today. Unbrako Socket Screw Division, STANDARD PRESSED STEEL Co., Jenkintown 1, Pa.

*T.M. Reg. U.S. Pat. Off., The Nylok Corporation

STANDARD PRESSED STEEL CO.

UNBRAKO SOCKET SCREW DIVISION

SPS

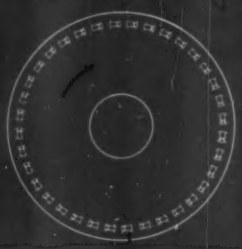
JENKINTOWN PENNSYLVANIA

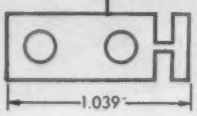
Gardner dual fixturing adds versatility

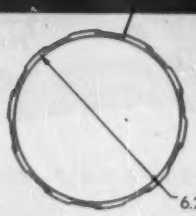
rotary carrier for small parts

interchangeable

gun-type fixture for larger parts







Gardner Double Disc Grinder 115-20" with drawings of work carriers and workpieces.

Production:
2100 parts per hour
Stock Removal:
.020" over-all, rough cut
.010" over-all, finish cut

Tolerances

Flatness:	.0003"
Parallelism:	.0003"
Uniformity:	.001"
Finish:	11 RMS

Production:
1 part every 40 seconds
Stock Removal:
.011" to .016"

Tolerances

Flatness:	.001"
Parallelism:	.0003" to .0004"
Uniformity:	.0008"
Finish:	11 RMS

grinds TWO parallel surfaces in ONE operation

GARDNER

precision disc grinders

BELOIT, WISCONSIN

New Warner & Swasey 3AC

SINGLE SPINDLE AUTOMATIC CHUCKER widens field of profitable turning jobs

This versatile, new model was engineered for fast, automatic machining of your larger, complex chucking jobs. It provides accuracy, metal removal capacity, tooling flexibility and set-up ease and speed heretofore unobtainable by automatic operation in this work range.

SETS UP FAST—LIKE A TURRET LATHE

For over eight years, enthusiastic users have told us, "Performance records of our Warner & Swasey Single Spindle Chucking Automatics have been phenomenal."

The 1AC model, first introduced at the 1947 Machine Tool Show in Chicago, met with instant field acceptance. In 1953 — 88 customers placed orders for the 2AC model before the first machine was ever built!

Now, Warner & Swasey announces a new, larger capacity, more powerful 3AC model with a 15-inch diameter chuck and a 40-horsepower motor, which will provide fast, automatic production for your larger pieces — precision and otherwise — in all lot sizes.

Our Field Representative will be glad to give you complete details on how this new machine can increase profits on your operations. Why not call him in, today?

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

No matter which way you turn... Warner & Swasey cuts costs

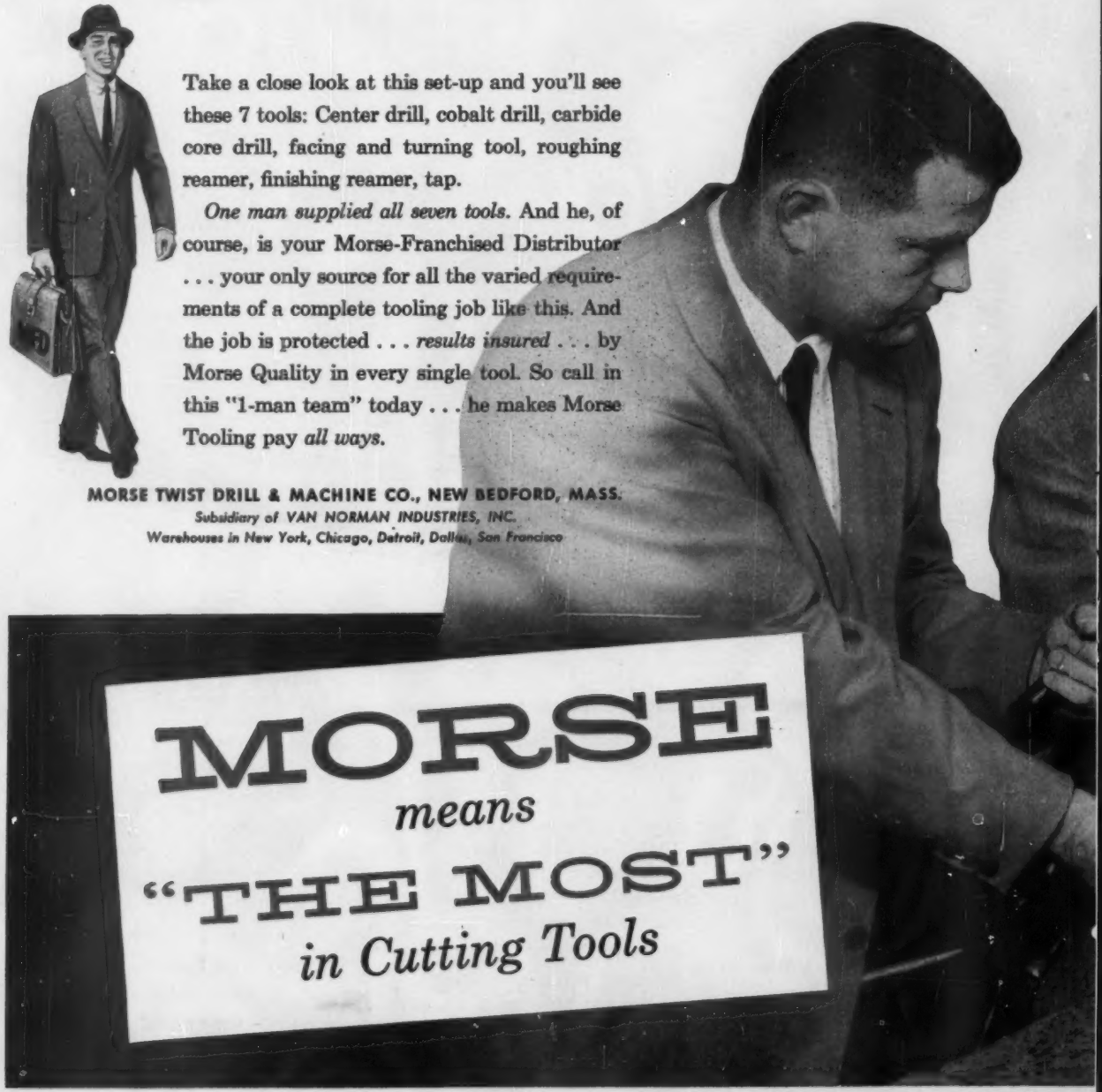
No matter how many cutting tools
You can get the "whole package"

MORSE-FRANCHISED

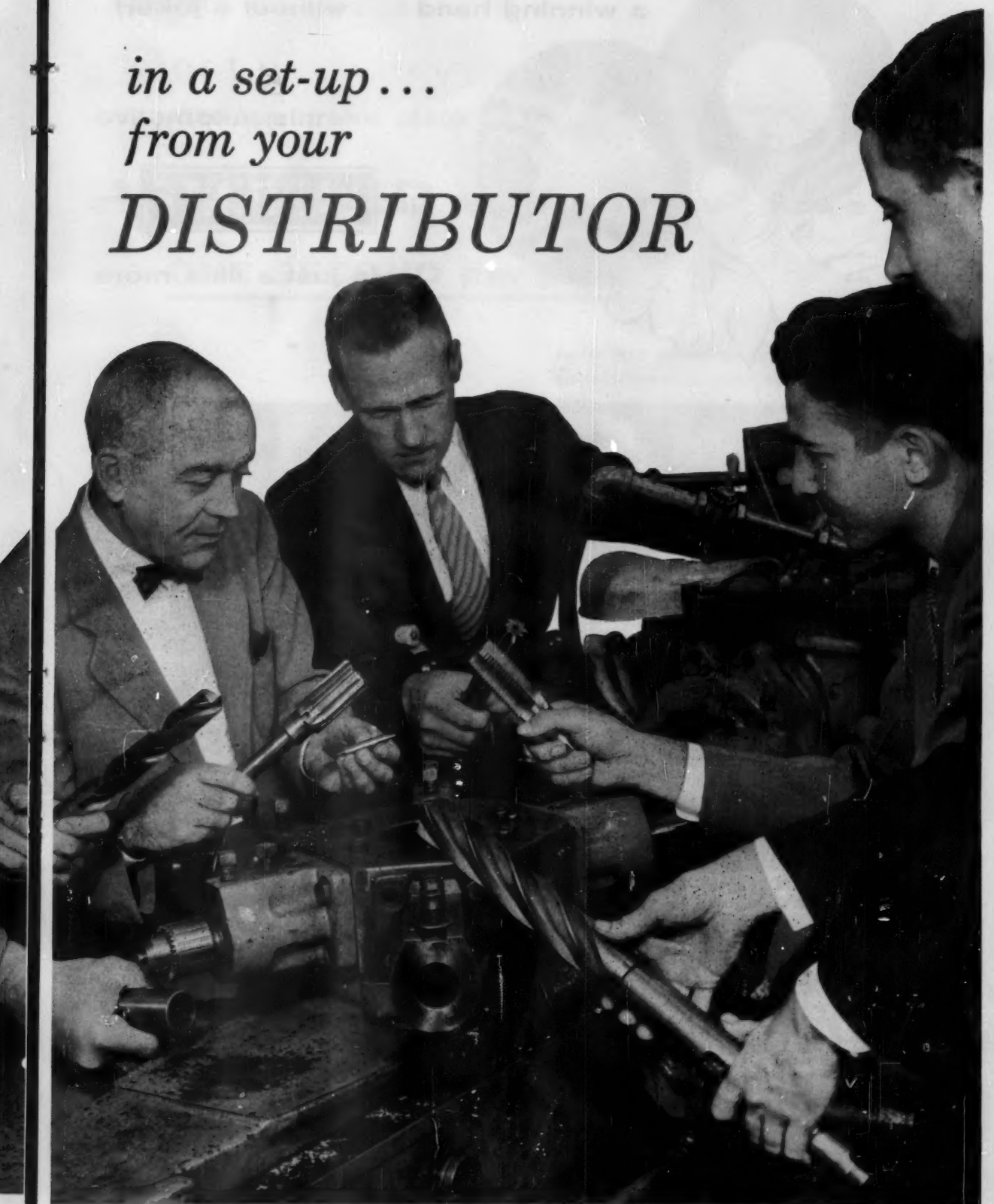
Take a close look at this set-up and you'll see these 7 tools: Center drill, cobalt drill, carbide core drill, facing and turning tool, roughing reamer, finishing reamer, tap.

One man supplied all seven tools. And he, of course, is your Morse-Franchised Distributor . . . your only source for all the varied requirements of a complete tooling job like this. And the job is protected . . . *results insured* . . . by Morse Quality in every single tool. So call in this "1-man team" today . . . he makes Morse Tooling pay *all ways.*

MORSE TWIST DRILL & MACHINE CO., NEW BEDFORD, MASS.
Subsidiary of VAN NORMAN INDUSTRIES, INC.
Warehouses in New York, Chicago, Detroit, Dallas, San Francisco



in a set-up...
from your
DISTRIBUTOR

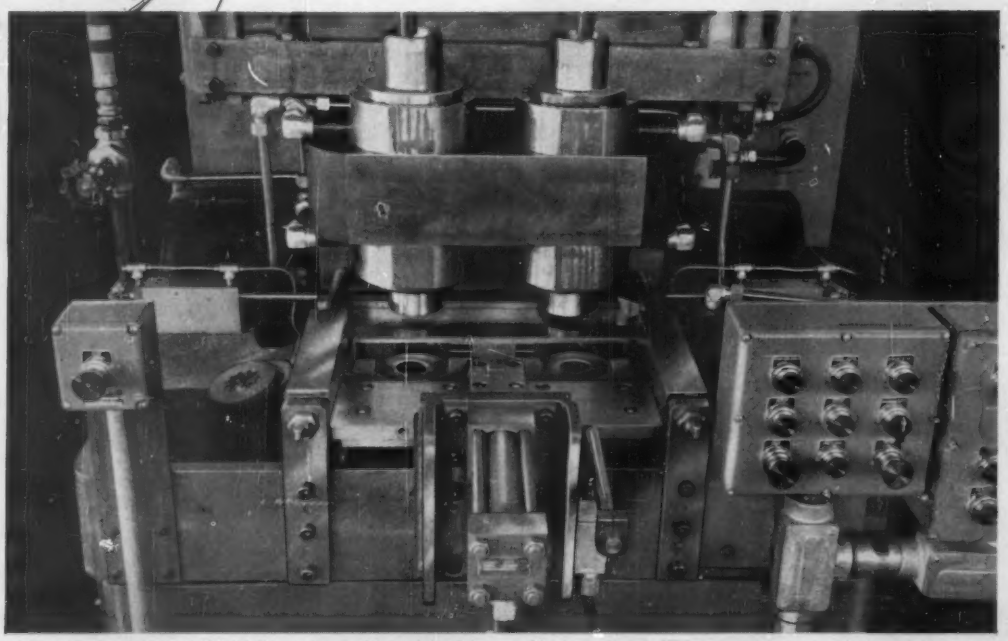


a winning hand . . . without a joker!

this automotive

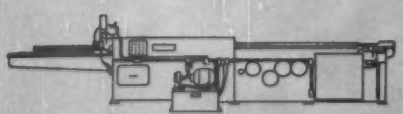
is LAPOINTE —

in just a little more

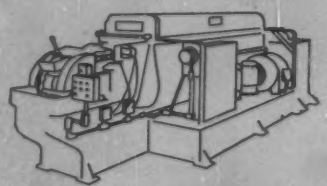


This efficient LAPOINTE VPD Broaching Machine pulls two broaches at a time, each broach going through a stack of 20 parts. The operator loads both chambers of the fixture while broaches are returning to pre-cut position. Hydraulic clamping is used, on the Lapointe-built In-and-Out table.

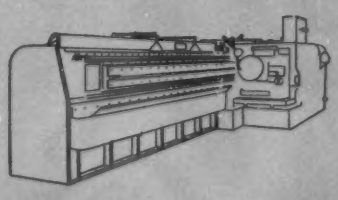
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



60" STROKE HORIZONTAL, ELECTRIC



CH CONTINUOUS BROACHING, ELECTRIC

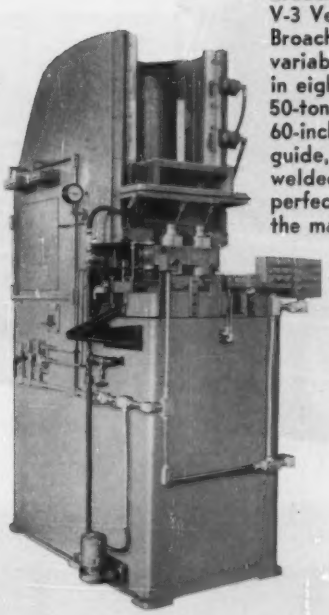


SRHE SINGLE RAM HORIZONTAL, ELECTRIC

transmission brake plate

BROACHED (minor diameter and 11 involute splines)

than ONE SECOND per part!



For high production internal broaching, this LAPOINTE V-3 Vertical Pull-Down Broaching Machine, with variable speed, is available in eight sizes from 5- to 50-ton capacity, 36- to 60-inch stroke. Massive broach guide, integral with heavy welded steel frame, maintains perfect alignment with the main slide.

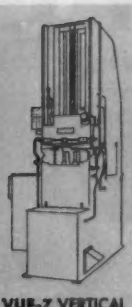
Faster than breathing, these parts are automatically ejected into a chute at the end of each broaching stroke at the money-making rate of 3200 per hour! (And this figure is net, based on 80% efficiency.)

The involute spline form is accurate, the tolerances are close, the broached surfaces have a fine finish. There's no argument here, as to the advantage of converting to Lapointe-Broaching!

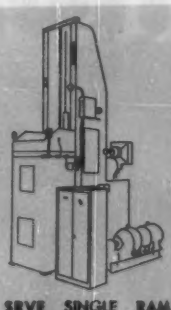
Perhaps you should convert, too? Even a quick glance at some of your operations may reveal several that could be more *logically* performed by Lapointe-Broaching. A Lapointe Field Engineer will gladly discuss any of these operations with you . . . and will also point out how Lapointe can take full responsibility for your complete broaching program. Lapointe designs and builds the broaching machines, designs and builds the broaching fixtures, designs and makes the broaches.

THE LAPOINTE MACHINE TOOL CO.
HUDSON, MASSACHUSETTS • U.S.A. In England: Watford, Hertfordshire

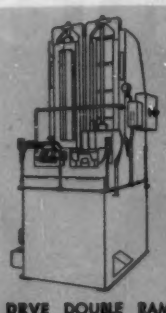
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES



VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC



DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE
known to be the best in
BROACHING

LeBlond 25" Heavy Duty Lathes
LeBlond 32" Heavy Duty Lathes (shown)

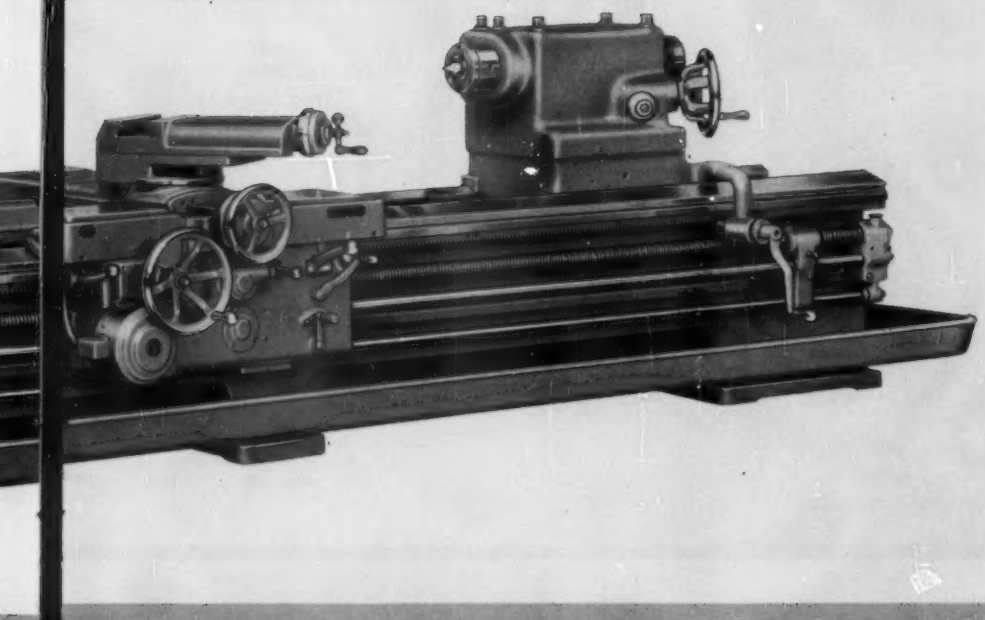
for today's toughest

50 hp on the 25″, 60 hp on the 32″. Here's proof of efficiency—maximum no-load friction hp on the 32″ is only 3.4 hp @ 500 rpm.

High-capacity 4-bearing spindle. One-piece double-wall apron. Heavy, short shafts; hardened and ground gears. Hardened and ground compensating steel bed ways.

4-directional power rapid traverse, controlled with a single lever. Direct-reading, color-keyed speed change levers. Single-lever feed control.

Adjustable torque to bring heavy work pieces up to speed safely. Similar adjustments for stopping and jogging.



turning

... cut with confidence

LeBLOND
of Cincinnati

THE R. K. LEBLOND MACHINE TOOL CO., CINCINNATI 8, O.

World's Largest Builder of A Complete Line of Lathes for More than 70 Years

From coast to coast there's no grinding wheel service like Norton...

for your General Purpose Grinding or your High Production Jobs

Norton Nation-Wide Service Is Complete

Your Norton Distributor is one of over 315 in the United States. His men are trained to help you in grinding techniques and wheel selection. Also, he's ready to call in a Norton Abrasive Engineer for expert aid in any of your complicated grinding problems. His sizable grinding wheel stocks are fitted to the needs of his area — and they're backed by the world's largest stock, located in five Norton warehouses, as well as at Norton's Worcester headquarters. Norton manufactures grinding wheels on both coasts, at Worcester, Mass. and Santa Clara, California.

PACIFIC OCEAN

Get These Facts and Prices

The new catalog *Norton Grinding Wheels*, Form 1052, brings you a lot of general purpose information and describes wheel specifications that will bring you best results. Every item in this catalog is available from stock. Included is a new supplement showing net prices. Get one from your Norton Distributor. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. Behr-Manning Company, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts. **For the booklets or other information write to Norton Company, Worcester 6, Mass.**

W-1766

World's Largest Builder of A Complete Line of Lathes for More than 70 Years

Norton Wheels Meet Every Possible Need

Norton makes a really complete line of grinding wheels to save you time and money across the widest range of grinding jobs . . . adding the same profit-boosting "Touch of Gold" to your general purpose grinding as to your production jobs. Norton wheels are made in every abrasive-and-bond combination you need, including the new, revolutionary 44 ALUNDUM* abrasive that's tops among all non-premium priced aluminum oxide abrasives.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES

Making better products . . . to make your products better

NORTON PRODUCTS:
Abrasives • Grinding Wheels
Grinding Machines • Refractories

BEHR-MANNING PRODUCTS:
Coated Abrasives
Sharpening Stones • Behr-cat Tapes

ACCO Registered* Wire Rope Slings

Get This Flexibility with Cable Laid Construction In--

THE SAFEST SLINGS MADE

• Cable Laid Slings are really different. These specialized slings combine the flexibility of manila rope with the strength of steel. And to this extreme flexibility they add freedom from crankiness and resistance to kinking. The result is a sling which handles easier—saves time—cuts operating costs.

This performance is possible only because of the combination of special wire rope construction with ACCO's patented DUALOC endings. GALACCO coating, an ACCO exclusive, keeps Cable Laid Slings bright and clean and imparts maximum corrosion resistance.

Safest Slings Made • ACCO Cable Laid Slings, like all of the other slings in ACCO's complete selection, are Registered—incorporate extra safeguards, which make them the safest slings made.

Each individual component, made from the highest quality material suited to its use, is tested before assembly—must prove to have strength equal to or greater than the sling body. These components are then assembled into slings according to precisely-engineered designs which have proven their safety and reliability in extensive field tests.

Each completed sling is then proof-tested at twice the load-carrying capacity for which it is rated. Then, and only then, does it receive the coveted registration certificate and tag.

Get the details on Cable Laid, or any other ACCO *Registered* Wire Rope Slings, from your distributor—or call the nearest ACCO district branch below.

FREE FOLDER: Write the Wilkes-Barre office for your copy of new folder **DH-532** which gives details on ACCO *Registered* Cable-Laid Slings.

*Trade Mark Registered

ACCO

Wire Rope Sling Department, American Chain & Cable Company, Inc.

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn. In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ont.

TRADE MARK

Tear this chart out and preserve it

YOUR GUIDE TO COLUMBIA DIE AND SHOCK STEEL GRADES

TYPE AND GRADES	DESCRIPTION	HARDENING RANGE	QUENCH	TEMPERING RANGE	USEFUL HARDNESS
D3 — SUPERDIE	High carbon, high chromium, high production, oil hardening type with maximum resistance to abrasion for highest production	1700° F. to 1750° F.	Oil or Salt Bath	400° F. to 1000° F.	65/55 Rc
D2 — ATMODIE **D2S — ATMODIE SMOOTHCUT**	Air hardening, high carbon, high chromium, non-deforming heavy duty long run die steel with better toughness — also available with smoothcutting additives	1800° F. to 1850° F.	Air	400° F. to 600° F.	62/58 Rc
A2S — E-Z-DIE SMOOTHCUT	Air hardening 5% chromium, deep hardening die steel with smoothcutting additives for maximum economy	1750° F. to 1825° F.	Air	400° F. to 600° F.	62/58 Rc
01 — EXL-DIE	Standard manganese chromium tungsten non-deforming oil hardening die steel for guages, plastic molds, jigs and fixtures	1450° F. to 1500° F.	Oil	350° F. to 450° F.	64/60 Rc
S1 — BUSTER ALLOY	Tungsten chromium oil hardening shock resisting steel for heavy duty dies and punches for cold and hot work available in .50% carbon for maximum shock resistance, .60% carbon for best cutting edge life	1650° F. to 1750° F.	Oil	400° F. to 800° F.	61/52 Rc
S5 — CEC SMOOTHCUT	Silicon manganese alloy steel plus smoothcutting additives for heavy punching, shearing and shock applications, also tool shanks	1550° F. to 1600° F. 1600° F. to 1650° F.	Water Oil	400° F. to 600° F. 400° F. to 600° F.	62/57 Rc 62/57 Rc

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILLINOIS

CENTRAL OFFICE AND WORKS, CHICAGO HEIGHTS, ILLINOIS — BRANCH STOCKS IN THE FOLLOWING CITIES:

1957

Chicago 32 — 4832 S. Kedzie Ave. — Phone LAfayette 3-3632
Cincinnati 25 — 2716 Spring Grove Ave. — Phone MUlberry 1-8400
Cleveland 14 — 1640 St. Clair Ave. — Phone MAin 1-1785
Detroit 3 — 121 Oakman Blvd. — Phone TUlsa 3-3770
Los Angeles 22 — 6955 E. Bandini Blvd. — Phone RAymond 3-4684
Milwaukee 4 — 426 S. Sixth St. — Phone BRoadway 6-0255
St. Louis 13 — 5118 Easton Ave. — Phone FOrest 1-0641

REPRESENTATIVES IN THE FOLLOWING CITIES: Dayton, Erie, Grand Rapids, Hartford, Indianapolis, Louisville, Moline, Newark, Portland and St. Paul

TOOL COLUMBIA STEELS

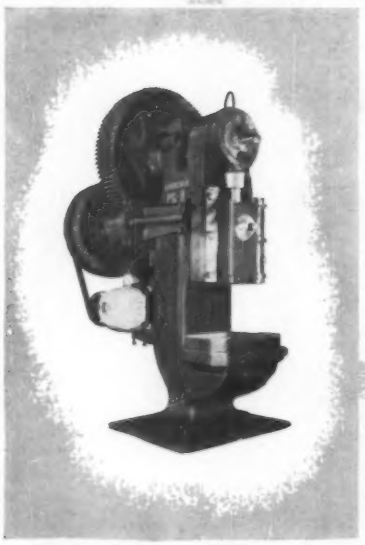
COLUMBIA TOOL STEELS

HIGH SPEED STEELS: Clarite — Vanite — Acmite — Cobite — Maxite — Molite Smoothcut Molite #3 HOT WORK STEELS: Clarite HW — Formite #3 — Formite #2 — Molite HW10 — Vanadium Firedie — Alcodie — Firedie CARBON TOOL STEELS: Columbia Special — Vanadium Extra — Waterdie Extra — Columbia Extra — Columbia Extra Headerdie — Vanadium Standard — Columbia Standard

Send for Catalog P-100
STANDARD THROAT—NON-ADJUSTABLE BED
Ferracute Punching Presses. 20 to 105-ton models.

Send for Catalog P-300
DEEP-THROATED—12 to 42-INCH THROATS
Ferracute Punching Presses. 20 to 105-ton models.

Which of these presses fits your purpose now?



Send for Catalog P-400
150-TON AND 200-TON MODELS
Ferracute Punching Presses.

Send for Catalog P-200
ADJUSTABLE BED—STANDARD THROAT
Ferracute Punching Presses. 20 to 105-ton models.

Since 1863
FERRACUTE

FERRACUTE MACHINE COMPANY
Builders of Power Presses and Special Machinery
479 Commerce Street, Bridgeton, N. J.

. . . "*Positive Duplication—offered* ONLY *by* CINCINNATI (PD)° GRINDING WHEELS—*is a remarkable achievement in precision manufacturing and quality control!*"

And no wonder everybody's shouting the praises of CINCINNATI (PD) WHEELS. *You can save money . . . and increase your production . . .* when (PD) WHEELS are on the job. For through the CINCINNATI (PD) Manufacturing Process you are assured Positive Duplication of the original wheel *every* time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

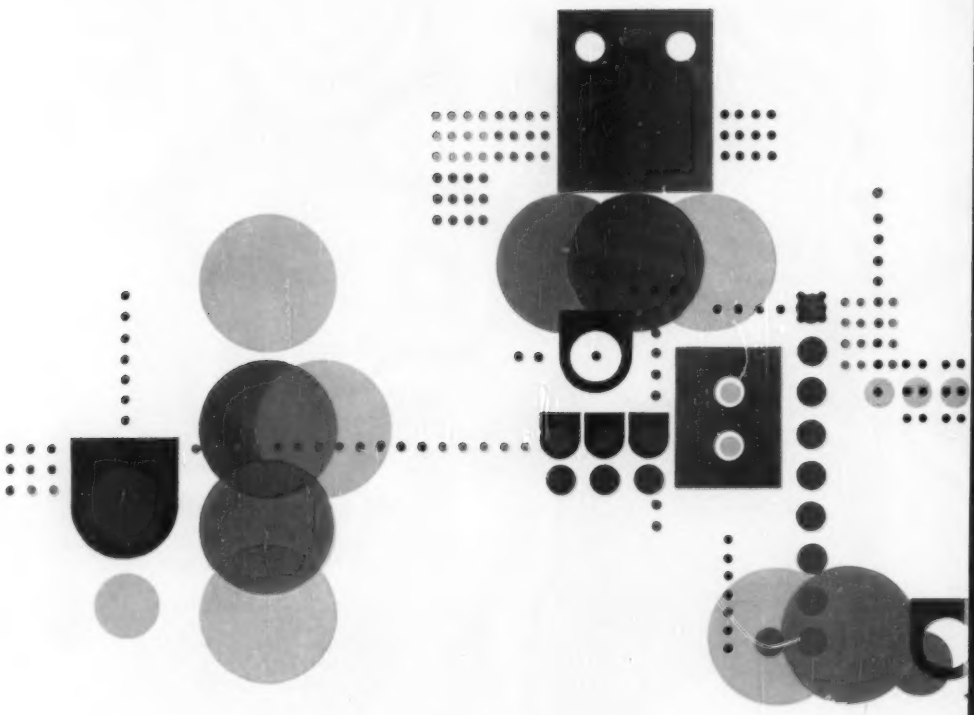
Yet CINCINNATI (PD) WHEELS are priced no higher than ordinary wheels.

For complete details, see your CINCINNATI (PD) Grinding Wheels distributor, or contact us direct. We'll be happy to send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Telephone (or wire or write) Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, °Ohio.

Remember—*only* CINCINNATI Grinding Wheels give you . . . (PD) POSITIVE DUPLICATION

CINCINNATI°
Grinding Wheels
A PRODUCTION-PROVED PRODUCT OF
THE CINCINNATI MILLING MACHINE CO.

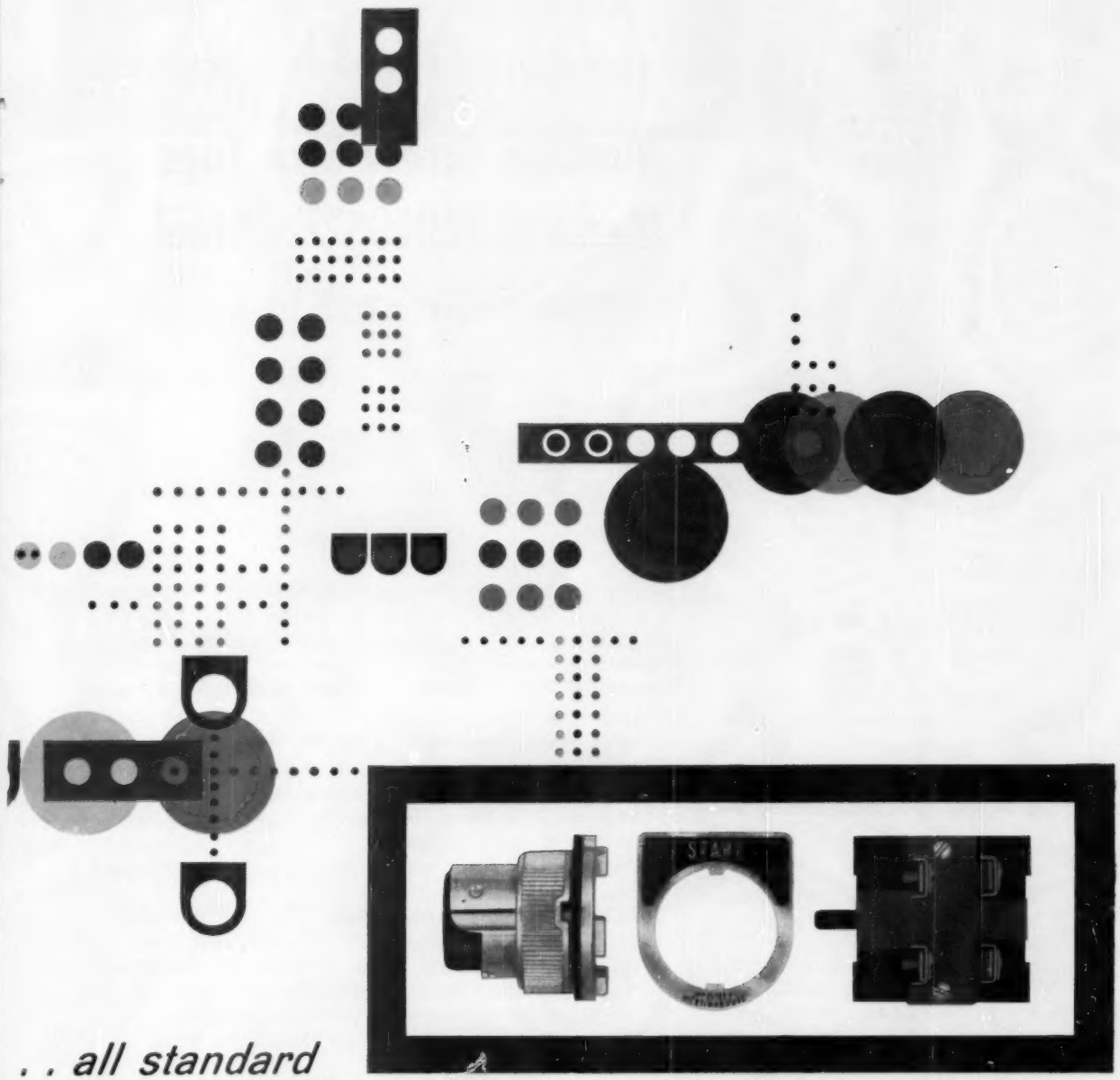
°Trade Mark Reg. U. S. Pat. Off.



Pushbutton control arrangements almost to infinity . . .

. For complete details, see your CINCINNATI (PD)

*Trade Mark Reg. U. S. Pat. Off.



. . all standard

How'd you like a stock of 1,500,000 pushbutton controls on hand at all times for original equipment needs or for production purposes?

Sound prohibitive space-wise, or too expensive? Not at all. Just 38 Westinghouse components (shown above) do it because all parts are standardized and interchangeable. And always available from stock.

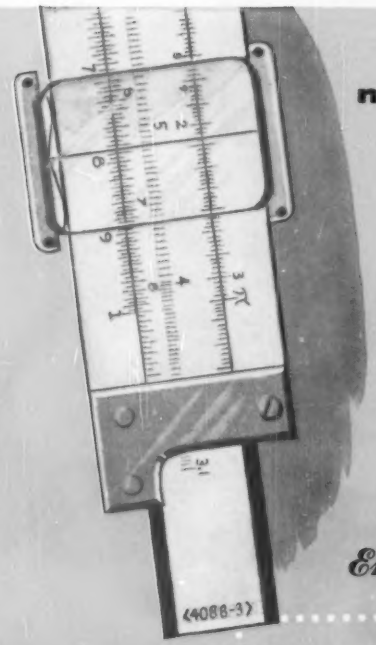
If you need controls for any application, write for the free 72-page *Pushbutton Guide*, B-6749. For control where moisture is a problem, write for free Booklet, B-7022, about Oil-Tite* controls. Write to Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. Or call your Westinghouse Distributor.

*T. M.

J-30248

YOU CAN BE SURE... IF IT'S

Westinghouse



now in stock at DoALL

Machine Screw Size Taps Made of TUNGSTEN Steel at no extra cost to you

- LESS BREAKAGE
- LONGER CUTTING LIFE
- LOWER TAPPING COSTS

Engineered for Outstanding Performance

All DoALL machine screw size taps (0 through 14) are made of 18-4-1 grade Tungsten steel, rather than moly steel. You get this premium grade from DoALL at standard prices. These taps are guaranteed to give you lower tapping costs, less downtime, more production than moly steel taps in the same sizes. Here's why:

Greater Wear Resistance—Tungsten steel stays sharper longer.

Less Breakage—When taps become dull, it takes more torque to drive them. This is one of the main causes of breakage of small diameter taps. Because 18-4-1 tungsten steel taps stay sharp longer, frequency of tap breakage is reduced to a minimum.

DoALL Taps Are Precision-Made. The hook, flute contour and flute spacing are properly related to best meet your needs. Stock taps are never reworked to specification. Taps are factory-finished and stocked in all sizes and type combinations to meet your specific requirements.

For trouble-free tapping, call DoALL, or write.

THE DoALL COMPANY
Des Plaines, Ill.

There's a DoALL Tap for every job . . .

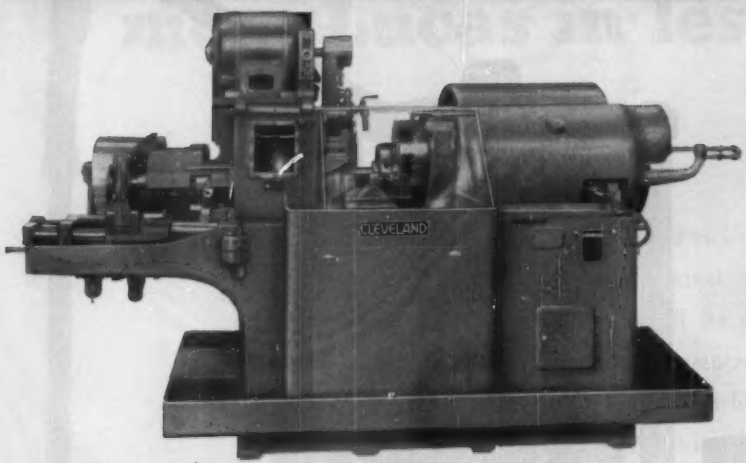
STANDARD FRACTIONAL SIZES AVAILABLE

¼" thru 1½" in all types and sizes also specials *in stock for* tough or unusual threading problems: left hand; .005 oversize and special pitches.

ASK FOR NEW CATALOG B-2
Listing all DoALL taps in stock for immediate delivery.

Friendly DoALL Stores in 38 cities give you personalized service and local delivery from complete stocks.

new CLEVELAND 2½" MODEL "AW" SINGLE SPINDLE AUTOMATIC



CUTS YOUR COSTS 3 WAYS!

More than 65 years of automatic screw machine design experience has been engineered into this new Model "AW" Cleveland. Its many modern features will enable your shop to set new economy records for fast, accurate production of turned and formed parts . . . *and you save three ways:*

YOU SAVE ON BASE PRICE

Your savings start at the *first* cost, as the 2½" Model "AW" is offered at a base price of $3500 to $4000 *less* than other comparable automatics!

YOU SAVE ON SET-UP TIME

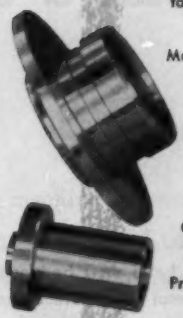
Such features as universal camming . . . rapid hand crank stock feed adjustment . . . quick change collet pads . . . maximum accessibility for tooling . . . make this Cleveland *quick* to set-up and exceptionally economical to operate. Spindle speeds range from 69 to 1920 rpm, providing efficient cutting speeds for all types of materials and tools. Four full automatic speed changes are available. Gear changes are quickly made.

YOU SAVE ON MAINTENANCE AND FREEDOM FROM DOWNTIME

Simplicity is the keynote of this Cleveland design. Completely free from complex mechanism and controls requiring constant attention or adjustments, this rugged, *fool-proof* automatic will assure the user dependable day-in, day-out performance!

To find out how much this new Cleveland can save you on your parts production, ask your Cleveland representative to submit a cost proposal with production estimates based on prints or samples of your work. There is no obligation.

Several examples of typical Model "AW" production are shown here. Note the profitable production rates—the variety of operations performed with simple tooling.



Material: 24ST Aluminum
Operations: Drill (2); C'bore; Ream; Face; Form (2); Cut-off.
Production: 62 pieces/hr.

Material: SAE 2317
Operations: Drill (2); C'bore; Tap; Face; Form (2); Cut-off.
Production: 41 pieces/hr.

Material: FM Brass
Operations: Drill (2); Thread; Bore; Form; Knurl; Cut-off.
Production: 110 pieces/hr.

Material: SAE 4615
Operations: Turn; Form (2); Thread; Center; Face; Chamfer; Cut-off.
Production: 36 pieces/hr.

Material: 24ST Aluminum
Operations: Drill (2); C'bore; Chamfer; Face (2); Form (2); Cut-off.
Production: 80 pieces/hr.

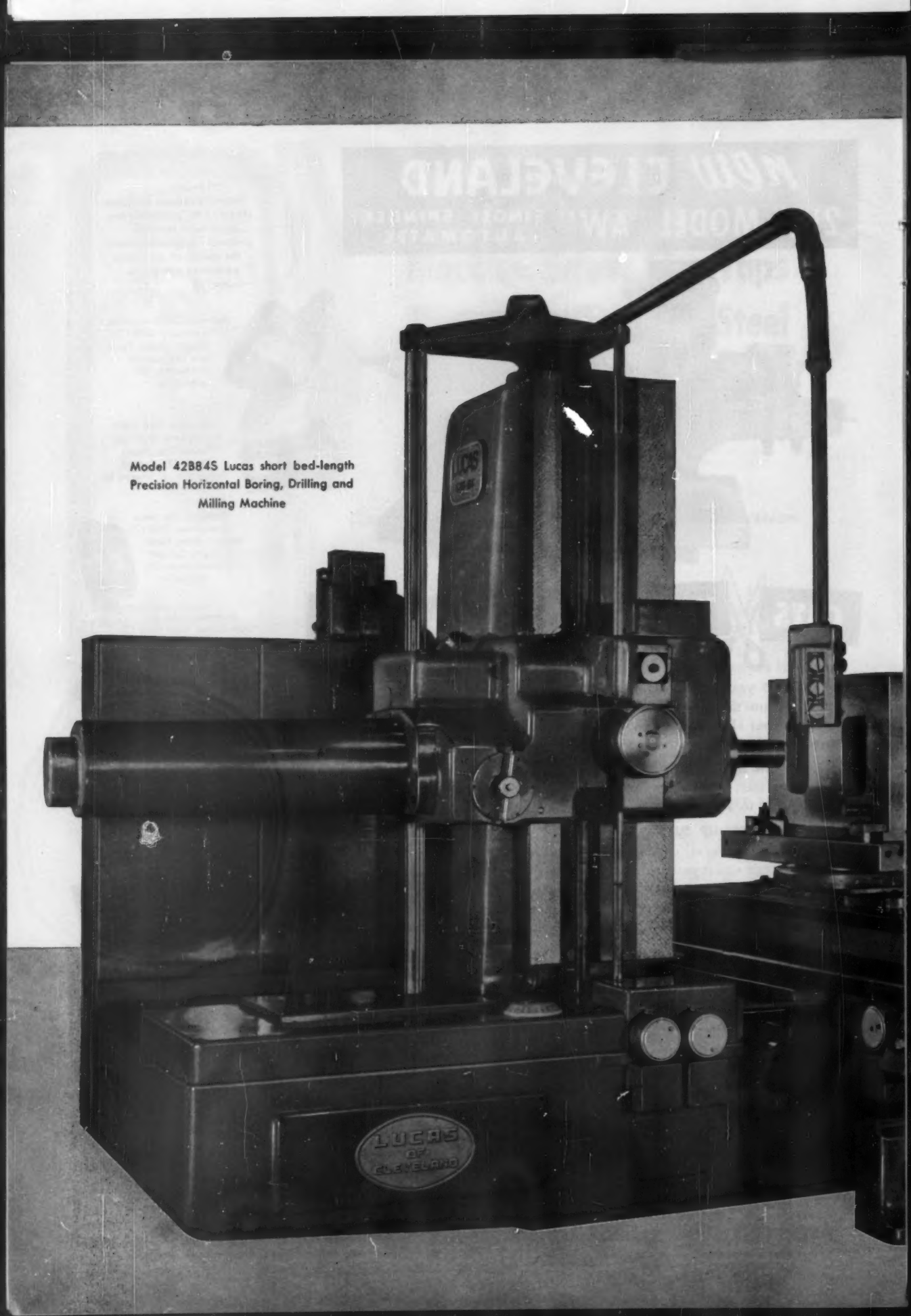
Write for this new bulletin for full details on the 2½" Model "AW" Cleveland

Remember: *Clevelands Cut Costs*

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

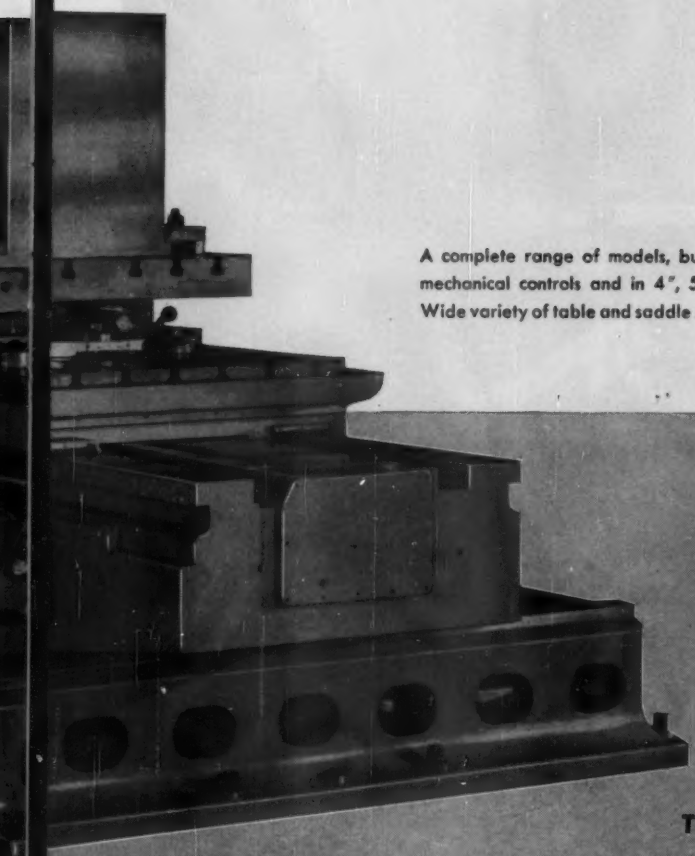
SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE



Model 42B84S Lucas short bed-length Precision Horizontal Boring, Drilling and Milling Machine

more Lucas in less space

This new horizontal boring, drilling and milling machine is a space and money saver on work where a backrest is not required. Lucas leads the parade by concentrating all its efforts on horizontal boring machines—by constant improvement, by incorporating every advance immediately. Every worthwhile improvement will be found first in a Lucas. Lucas Machine Division • The New Britain Machine Company, 12302 Kirby Ave., Cleveland 8, Ohio.



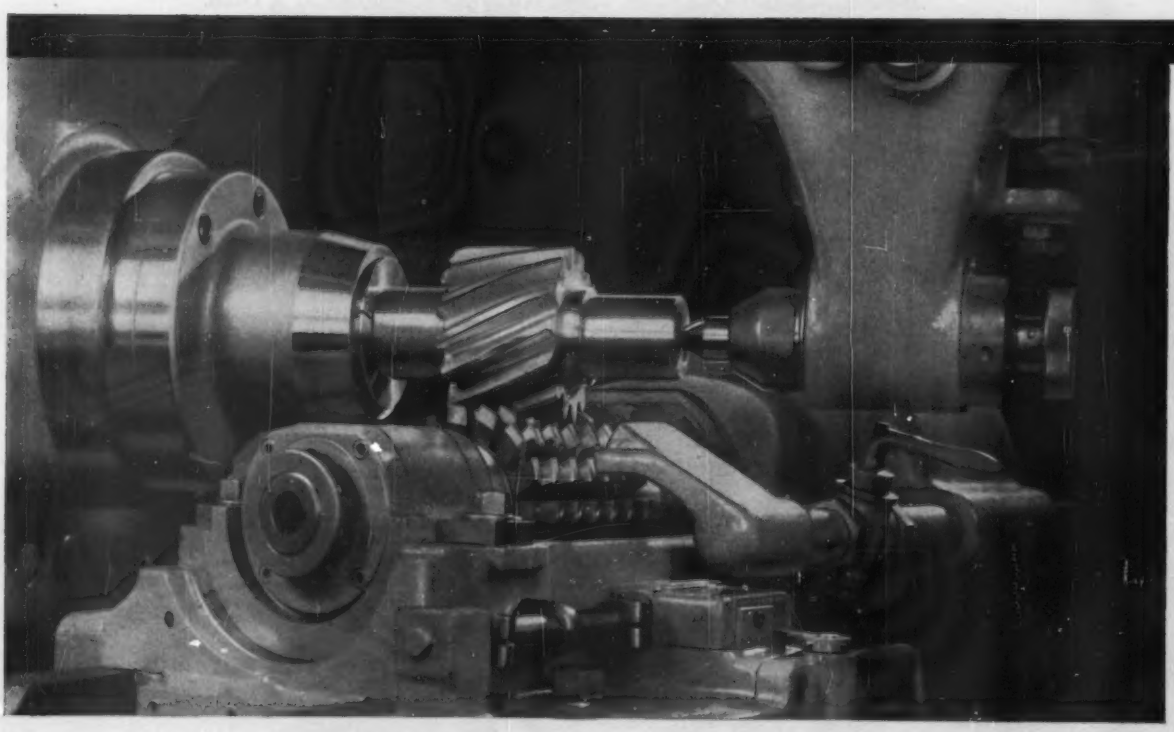
A complete range of models, built in 3", 4" and 5" spindle sizes with mechanical controls and in 4", 5" and 6" sizes with electrical controls. Wide variety of table and saddle sizes with two- or four-way beds optional.

LUCAS
OF
CLEVELAND

A DIVISION OF
THE NEW BRITAIN MACHINE COMPANY

crown hobbing

saves time and cost in producing accurately crowned gears



Crown-hobbing on this special Barber-Colman No. 14-15 Hobbing Machine is an ideal production method of generating crowned gear teeth. Where gears are now hobbed and then crown-finished in a secondary operation, they may be crown-hobbed in one operation. When a hobbed finish is satisfactory, the shaving operation can be completely eliminated. If the degree of finish required calls for a further finishing operation, such gears may be finished after crown-hobbing at less cost and in less time because hobbing provides uniform stock removal.

Crown-hobbing also makes it possible to hold a change in tooth thickness within the desired limits, and the tooth bearing can be located at the most desirable point consistent with the job conditions.

In the operation shown here, 4 DP., 14T, 18° P.A. transmission gears with 2¾" face are crown-hobbed on a special Barber-Colman No. 14-15 Hobbing Machine. Teeth are hobbed with a change in tooth thickness of .0045". The automatic cycle includes rough hobbing R. to L. at a given depth, automatic lowering of the work slide against the crowning cam, climb hobbing L. to R. at a constantly changing depth, and rapid traversing out of cut. No further finishing is required in this particular case, and the gears are completed in one automatic operation, without changing tools or transfer to other machines. Savings on this part can be expected on the basis of the following comparison:

typical gear-crowning	crown-hobbing
Rough hob gear teeth.	Manually unload and load.
Transfer to other machine.	Automatic cycle — rough hob.
Semi-finish hob gear teeth.	R. to L., set to finish depth,
Transfer to next machine.	and crown hob L. to R.
Crown-finish gear teeth.	Manually unload and load.

The machine can be designed to suit your job requirements, either as a single-purpose machine, or as a universal machine for both crown and conventional hobbing. Parts can be hobbed in one or two cuts, depending upon specifications of the part. The cam can be designed to produce the tooth configuration required.

The machine required for crown-hobbing is provided with a cam mechanism for raising and lowering the work slide to produce a change in tooth thickness. The work slide is held against the rotary cam by hydraulic pressure in addition to its own weight. Change gears are provided in the cam drive so that different amounts of change in tooth thickness can be produced with the same cam.

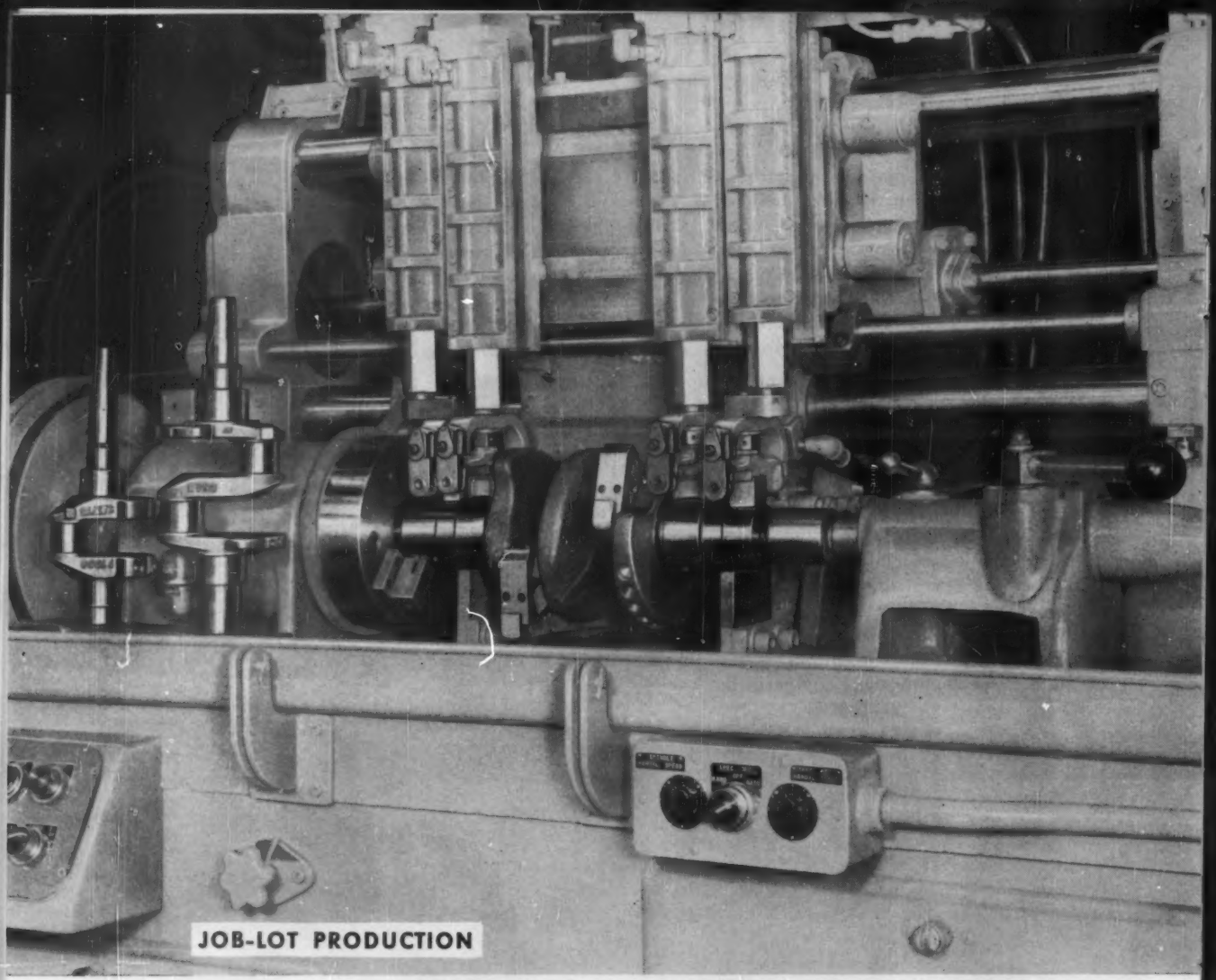
Send us drawings of your crowned-gears. Our engineers will analyze the job conditions and make recommendations for crown-hobbing.

BARBER-COLMAN COMPANY

711 ROCK STREET • ROCKFORD, ILLINOIS

Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

BARBER COLMAN



No. 51A General Purpose Superfinisher

CRANKSHAFTS in small job-lots are Superfinished with this setup—holding the piece between centers and driving from a keyway with a faceplate driver. Latch-on follower-type arms Superfinish the crank pins, while the main bearing and oil seal surfaces are Superfinished by standard overhead quills. Main and pin bearings are taken from a ground surface of 30 micro-inches down to 8 or less. Oil seal surfaces on shaft ends are Superfinished to 4 or less. Production: 44 to 53 pieces per hour at 80% efficiency.

NEED SMOOTHER SURFACES AT LOW COST? See the

BEEN LOOKING FOR AN INEXPENSIVE PROCESS to improve product quality—to help market your product easier against increasing competition?

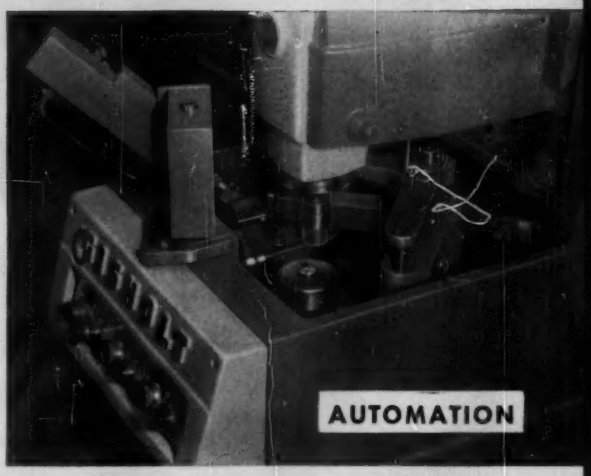
Gisholt Superfinishing may well be your answer ...it has been for some time for a long list of leading manufacturers.

With this modern process, you'll definitely reduce —or even eliminate—the cost and time of grinding, polishing or buffing operations. With the exclusive Gisholt Superfinishing method, you utilize a "scrubbing" effect through an abrasive stone which oscillates as the work rotates. Chatter marks, grind-

No. 4 Superfinisher Attachment

AXLE JOURNALS for railroad switchers are Superfinished with No. 4 Attachment on Gisholt Saddle Type Turret Lathe in this operation. In three steps, lathe finish of 200-250 micro-inches RMS is reduced to final surface finish of 8-10 RMS, removing .004″ to .005″ stock to eliminate tool marks. Through Superfinishing, 25 switchers logged 30,000 trouble-free hours on journals in first few months.

Superfinished tappet with .005-inch crowned top.



No. 81 High Production Superfinisher

CAST IRON VALVE TAPPETS are Superfinished in long runs on this job, featuring fully automatic handling with a work transfer device. Cup-shaped stones are used, Superfinishing from flat ground surface down to 5 micro-inches RMS or less—and rotating off center to generate .005″ crown on the cam end of each tappet. In only 16 seconds floor-to-floor time per piece, the valve tappets are economically Superfinished for longer wear life and better product quality.

NEW GISHOLT MASTERLINE SUPERFINISHERS

ing flats, and amorphous "smear" metal left by grinding are completely removed. The true base metal is exposed—providing longer wear and better performance from your product.

Better still, most Superfinishing jobs are done in a fast, automatic cycle—producing very low micro-inch surface readings in the shortest possible time.

The jobs shown here are typical examples where Superfinishing solved production problems and improved product quality. Ask your Gisholt Representative to tell you about them—and many more—in full detail. Call him today!

WRITE TODAY for 30-page illustrated booklet "Superfinishers," explaining Gisholt Superfinishing process in interesting detail.

MASTERLINE GISHOLT SINCE 1887 GISHOLT

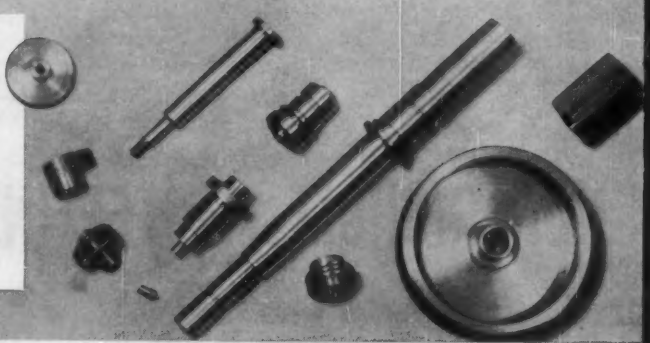
GISHOLT MACHINE COMPANY

Madison 10, Wisconsin, U.S.A.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • PACKAGING MACHINES • MOLDED FIBERGLAS PLASTICS

Republic
COLD FINISHED STEEL...

REPRESENTATIVE PRECISION PARTS made of Republic Cold Finished Steel are shown here. Parts like these have an enviable record of reliability—helping National Cash Registers to total more sales than any other machines, for more than a half century.



REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

PERFORMANCE PROVED

in National Cash Registers for over 50 years

The proof of the product is in its performance. That's why we take particular pride in supplying cold finished steel to The National Cash Register Company of Dayton, Ohio.

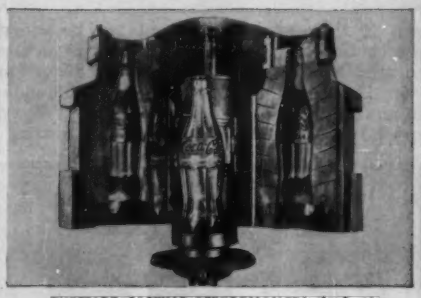
Republic Cold Finished Steel has been helping National Cash Registers ring up sales for more than a half century. Ever since the Union Drawn Steel Company, now our Union Drawn Steel Division, pioneered the cold drawing process, National Cash Register products have totaled enviable service records backed by the uniform excellence of Republic Union Drawn Carbon and Alloy Steel components.

You, too, can capitalize on the many outstanding advantages of Republic Cold Finished Steel. For example, in comparison with hot rolled bars, you get maximum machinability. This feature alone makes possible higher speeds and feeds, finer finished surfaces and longer tool life.

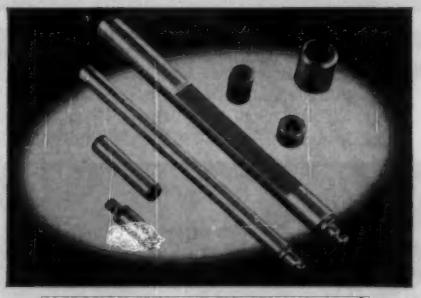
In addition your parts will have higher ultimate strength, yield point and hardness when you use Republic Cold Finished Steel. Extreme accuracy in size and cross section plus an as-received bright, smooth finish enable you to eliminate all further finishing for many applications.

Join the growing list of users scoring production gains through the use of Republic Cold Finished Steel. Contact your Republic representative or your Republic Union Drawn Distributor. Or mail the coupon for full details.

HEAVY-DUTY PERFORMANCE plus minimum weight are provided by these gear train components made of modern, flight-weight alloy steels. Republic, world's largest producer of alloy steels, can help you determine the precise analysis best suited to your application. Result: A superior product combining strength, toughness, and durability — plus production economy.



SUPERIOR CASTING PERFORMANCE is the basic reason why the manufacturer of this glass-mold insists on Chateaugay, Republic's exclusive premium pig iron. Requirements call for extremely smooth hand-finished surface with surrounding metal free of flaws or porosity. Dense, fine-grained Chateaugay castings meet every need. Rejects are less than 1%. Send coupon for further information.



CORROSION-RESISTANT PERFORMANCE in addition to machinability, strength, and toughness are four good reasons why the manufacturer of these carburetor parts has standardized on Republic Free-machining ENDURO® Stainless Steel Bars. ENDURO is available in a complete range of analyses in cold finished and hot rolled bars, special sections and wire. For complete information, mail coupon today.

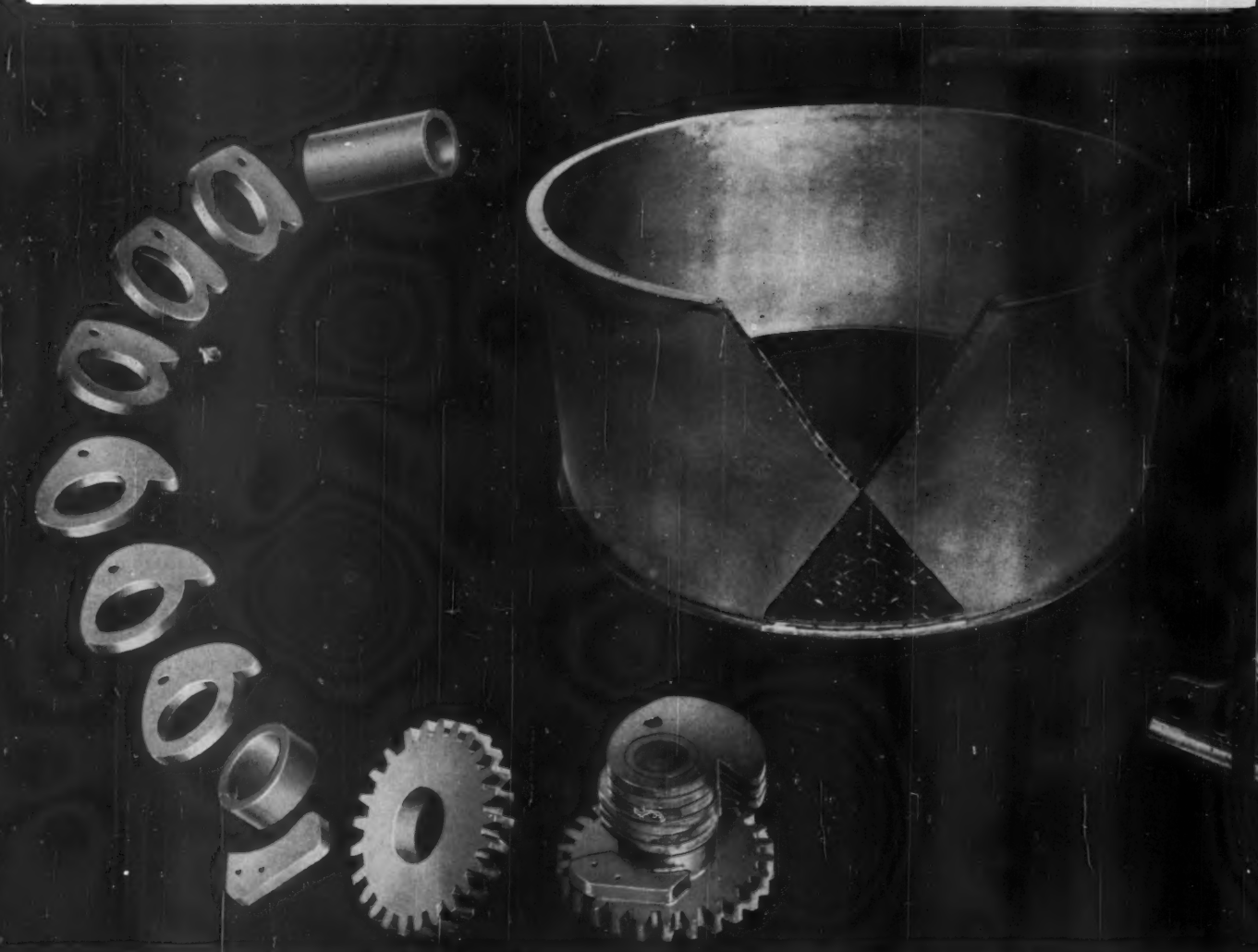
STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
Dept. C-2995
3102 East 45th Street
Cleveland 27, Ohio

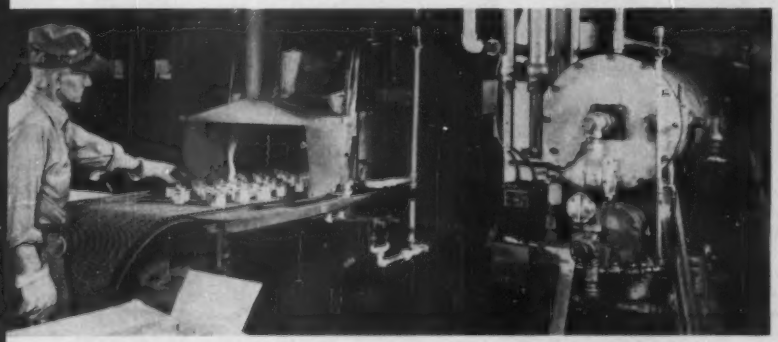
Please send me further information on:
☐ Cold Finished Steel ☐ Alloy Steels
☐ Chateaugay Pig Iron ☐ ENDURO Stainless Steel

Name_____ Title_____
Company_____
Address_____
City_____ Zone____ State_____

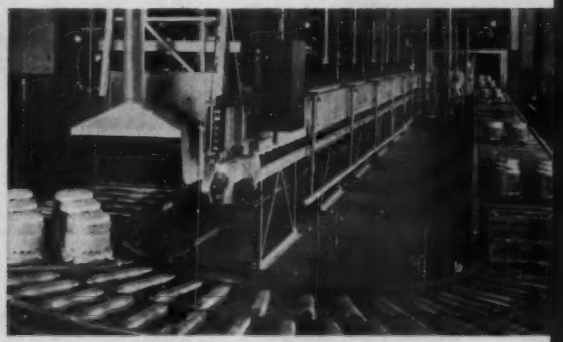


Versatility of furnace brazing is shown in these applications. Complex assemblies like the cam-and-gear cluster on the left can be fabricated from punched laminations brazed securely in a General Electric mesh-belt furnace. Required contours are obtained without expensive machining from solid stock.

Thin sections can be joined to heavy sections to produce light-weight rigid structures without sacrificing strength or inducing local distortion. Honeycomb structure at top center weighs about one fourth as much as solid assembly of same rigidity. It is typical of design improvements made possible by brazing in General Electric furnaces.



Continuous production of small parts in this General Electric mesh-belt furnace is carried out by loading assemblies directly on the belt. Protective atmosphere equipment, at right, eliminates need for flux in most cases, keeps parts clean enough to be passed directly from the furnace, without cleaning or pickling.

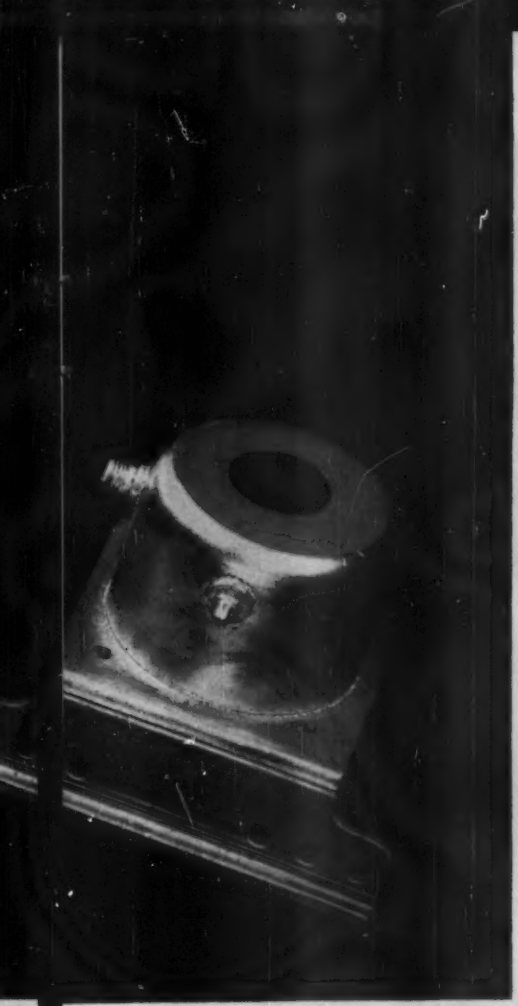


Automatic charging, and discharging and return conveyors of this General Electric roller-hearth furnace make it almost self-operating, reduces handling costs. G-E roller-hearth furnaces handle heavy assemblies and are well suited for automated lines.

GENERAL ELECTRIC SELLS
A COMPLETE LINE OF
HEAT PROCESSING EQUIPMENT

FURNACES • METAL-SHEATH • INDUCTION

Box | Cylindrical Pit | Roller Hearth | Elevator



Two or more metals can be joined, as in the bellows housing shown above. The steel flange is furnace-brazed to a brass shell, using preplaced rings of silver brazing alloy. The desirable qualities of each metal are retained.

Development work is done in this General Electric box furnace, which could also be used for job-lot production. Low in first cost, General Electric box furnaces need little maintenance.

Produce Complex Assemblies Faster and at Less Cost with General Electric Furnace Brazing

General Electric furnace brazing speeds production of really "tough" assemblies—and often does it at less cost than you can do it by your present methods.

For example, here are three types of work where you can improve production with furnace brazing.

You can make complex assemblies from already formed components, and save both material and machine costs.

You can make assemblies of two or more different alloys without changing the desirable characteristics of either.

You can join thin sections to heavy sections without sacrificing strength or inducing local distortion.

These characteristics of furnace brazing can be used in a number of widely different production setups. And General Electric's complete line of furnaces and associated equipment lets you pick the proper furnace to introduce furnace brazing into your particular setup—economically, efficiently.

Cost reductions are typical with furnace brazing because labor content per assembly goes down while output goes up. Waste is reduced since assemblies can be built up of components instead of being machined from solid stock. Uniformity of results frequently leads to reduced inspection costs.

Improved products are the rule with furnace brazing. Life of assemblies is increased because joints have high strength, resist vibration and impact, and are uniformly tight. Assemblies show little or no distortion, since they are free from localized strains. They present a good finished appearance without afterwork because the brazing alloy forms neat fillets. Also protective furnace atmospheres eliminate formation of oxides and do away with the need for flux in most cases.

Increased production over other joining methods is possible, since many joints can be brazed simultaneously. Furnace brazing is adaptable to continuous production, with increasing output.

For a careful analysis of your furnace brazing needs call your General Electric Heating Specialist. Ask him to show you how you can benefit by using furnace brazing. You can reach him at your local General Electric Apparatus Sales Office. If you prefer, send in coupon below for bulletins describing furnace brazing operations and equipment.

GENERAL ELECTRIC

FREE PROCESS BULLETINS

Section E721-B,
General Electric Company
Schenectady 5, New York

Please send me free bulletins checked below.

MODERN HEAT PROCESSING BULLETINS

- ☐ Furnace and Induction Brazing, GEA-5889
- ☐ Protective Atmospheres, GEA-5907

TECHNICAL BULLETINS

- ☐ How and Where to Use Furnace Brazing, GEA-3193
- ☐ Electric Furnace Brazing, GER-106
- ☐ Furnace Brazing of Machine Parts, GER-339

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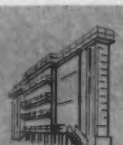
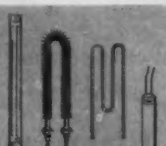
Mesh Belt

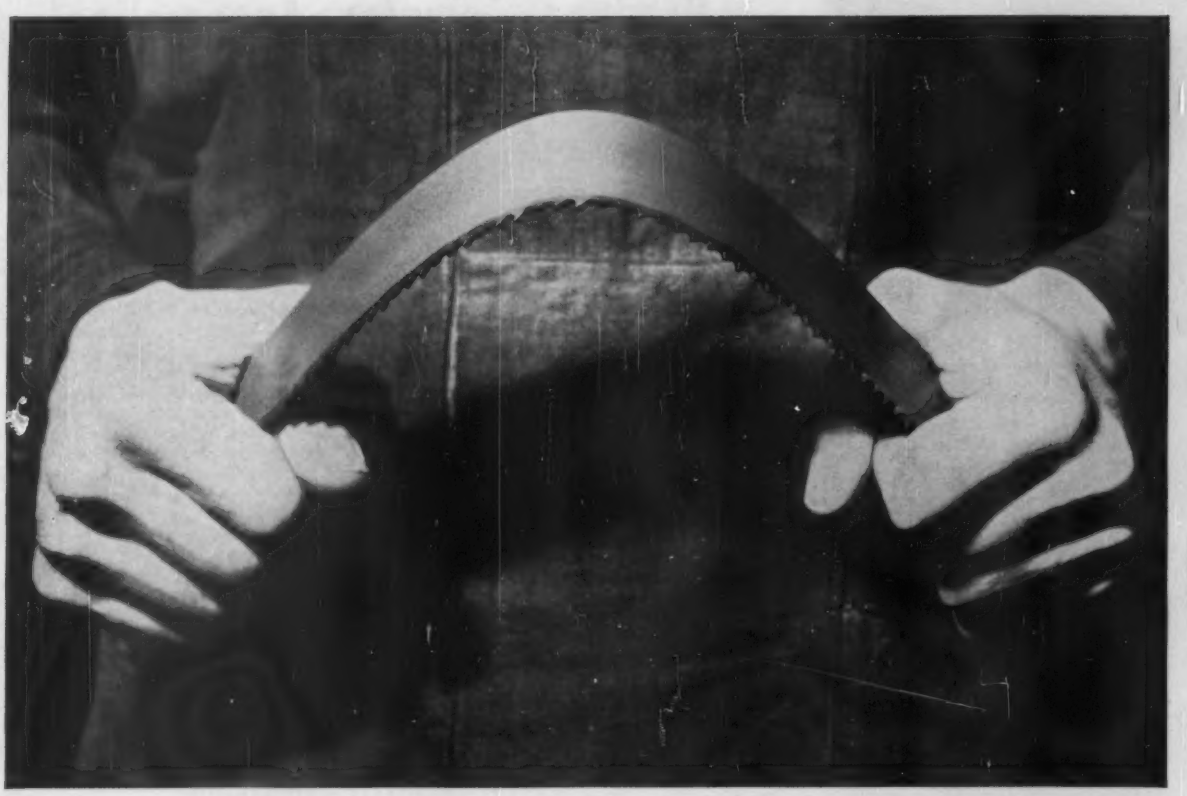
Rotary Hearth


Tower

Cylindrical Belt


Metal-sheath

Electronic Induction



THIS is No Ordinary Power Hack Saw Blade

This is the *unbreakable* MARVEL High-Speed-Edge Hack Saw Blade—the first bi-metal blade—invented, developed and introduced by MARVEL. This blade is a combination of two materials best suited to the requirements of an efficient hack saw blade . . . a narrow high speed steel cutting edge permanently welded to a tough, non-brittle alloy steel body. Each blade is triple tempered to assure long life and maximum toughness to the cutting edge. Development of this high-speed-edge blade made it possible to cut any kind of material from the free machining steels to the toughest of alloys, fast, accurately and economically. Just one type blade to handle any job — no switching blades to cut different materials. Like all good things, attempted copies of this blade have been numerous, but its performance has been *unequalled* by any of the imitators.

The MARVEL high-speed-edge hack saw blade can be tensioned from 200% to 300% tauter than any ordinary hack saw blade, a definite advantage which permits heavier feed pressures to be used without deflection or fear of breakage.

An extremely rugged cutting tool, this one type blade, the MARVEL High-Speed-Edge Hack Saw Blade, will cut any machineable metal with outstanding economy, accuracy, long life and complete safety—*it is unbreakable.*

Ask for MARVEL Blades by name and you can be sure you're getting the best on the market. Leading Industrial Distributors have them in stock.

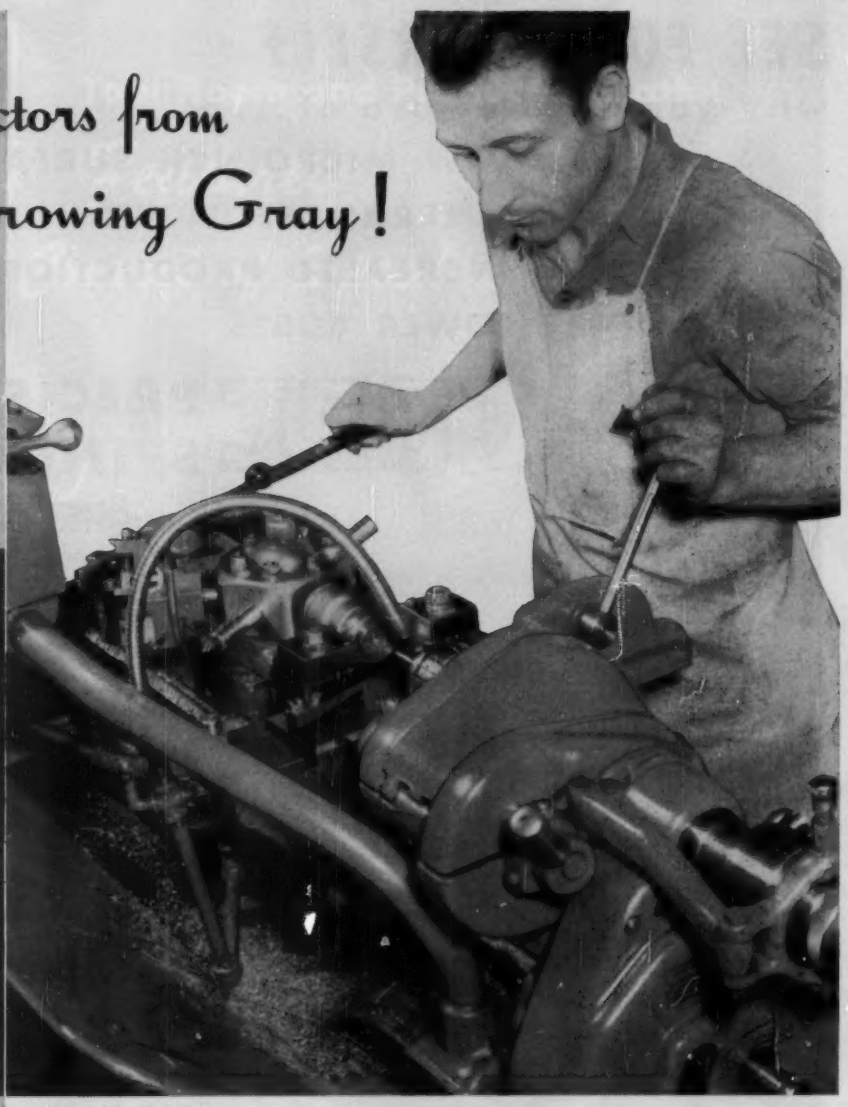
B-1120

Write for latest cutting tool Bulletin and the name of your nearest MARVEL Distributor

MARVEL Metal Cutting SAWS
Better Machines-Better Blades

ARMSTRONG-BLUM MFG. CO. 5700 W. Bloomingdale Ave., CHICAGO 39, U.S.A.

Keep Inspectors from Growing Gray!



SOUTH BEND 10" PRECISION TURRET LATHE

Put this precision turret lathe to work on your small, exacting jobs and you'll save yourself a lot of trouble. You'll find that even the tough tolerances can be held without sacrificing output to do it. Extremely versatile, easily and quickly tooled for a wide variety of work. Operators find it exceptionally smooth to handle. *Send now for complete information.*

SPECIFICATIONS: Swing 10⅛" • Collet capacity 1" • Spindle bore 1⅜" • Turret slide travel 4" • Spindle to turret 19⅜" max. • Spindle speeds 12 or 24 • Turning, facing, threading feeds for carriage, 70 each..... **Prices start at $1665**

SOUTH BEND LATHE—Builders of lathes, milling machines, shapers, drill presses, pedestal grinders.

SOUTH BEND

South Bend Lathe, South Bend 22, Indiana: Send information on—10" Turret Lathes,—13" and 16" Turret Lathes, —Engine and Toolroom Lathes, —Milling Machines, —Drill Presses, —Pedestal Grinders.

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- **TOLERANCES DOWN IN THE MILLIONTHS**
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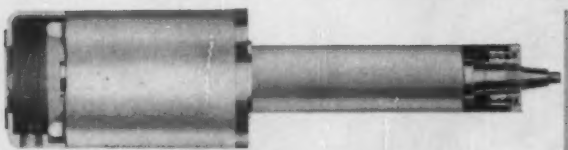
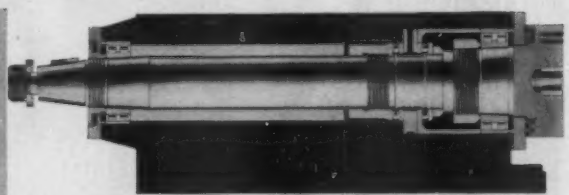


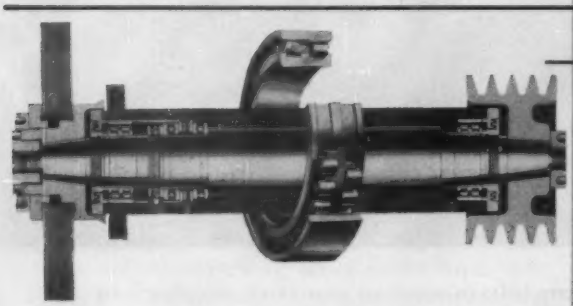
FOR SURFACE GRINDERS—

POPE 1, 2 and 3 HP, Totally Enclosed 1800 and 3600 RPM Motorized, Cartridge Type Spindles with massive shafts and big, double row cylindrical roller bearings having enormous capacity, superior performance and long life.



FOR BORING ROUND HOLES WITHIN MILLIONTHS OF AN INCH

POPE Heavy Duty Boring Spindles for smooth, chatter free, continuous high production of accurate parts. Again, look at the big cylindrical roller bearings and thrust bearings.



FOR CYLINDRICAL GRINDING—

POPE Cartridge Type and Wheel Head Belt Driven Spindles with the capacity to produce more work whether you plunge grind with a crush dressed wheel, remove surplus metal, or produce low microinch surface finishes. Note the super-precision radial bearings and ball thrust bearings.

FOR HEAVY DUTY MILLING—

POPE Spindles have the double row cylindrical roller bearings for the extra rigidity to support the cutting tool, and the double direction thrust bearings with the excess capacity to stabilize the shaft against endwise movement in either direction. This adds up to longer cutting tool life, more production, lower cost per piece.

POPE engineers and builds standard and special, precision anti-friction bearing Spindles for every purpose. Send us your specifications for prompt quotations.

No. 115

Specify **POPE®** PRECISION SPINDLES

POPE MACHINERY CORPORATION
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ELMIRA, N.Y.

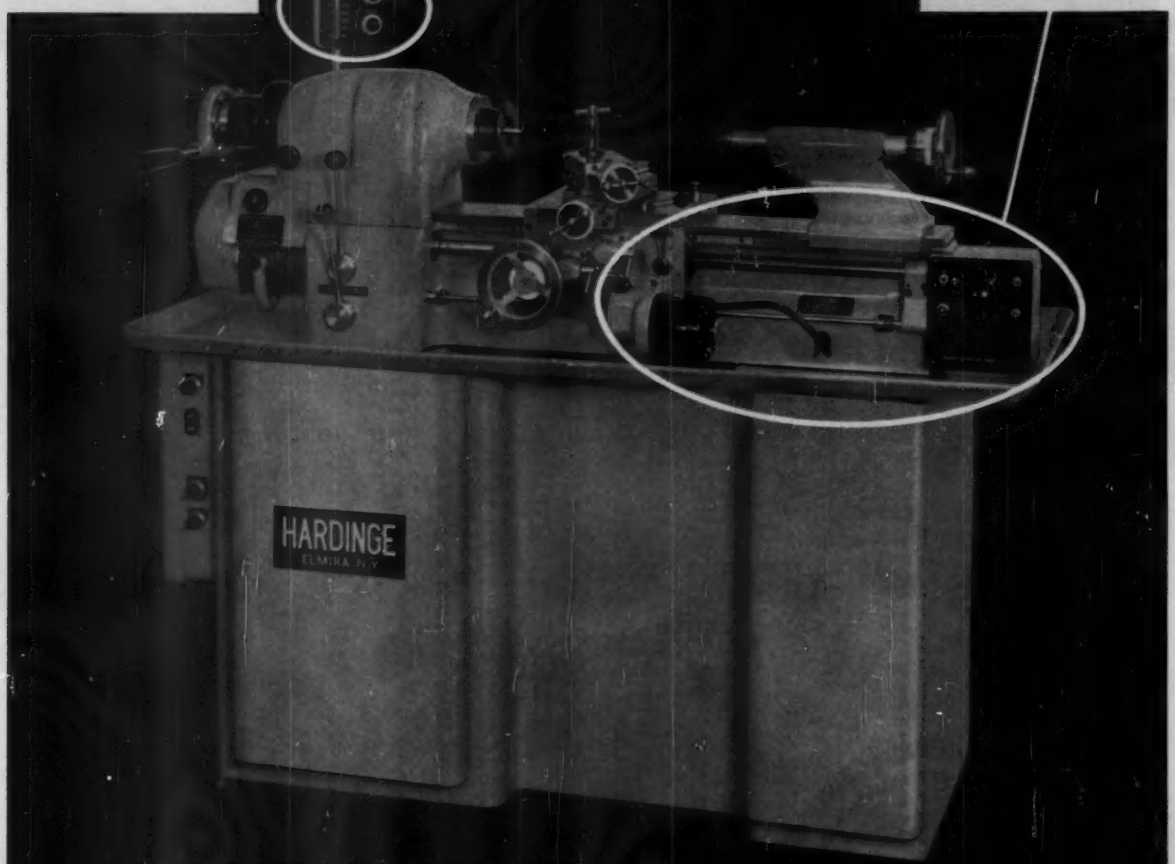
Tool Room and Production Lathe

Features

Infinite Control of Speed and Feed

Variable Speed Drive for Headstock Spindle

Variable Feed Drive for Carriage and Cross Slide



RIGIDLY BUILT TO TAKE ADVANTAGE OF CARBIDE CUTTING TOOLS AT HIGH SPEEDS.

Both drives are independent and infinitely variable to secure every possible combination of speeds and feeds.

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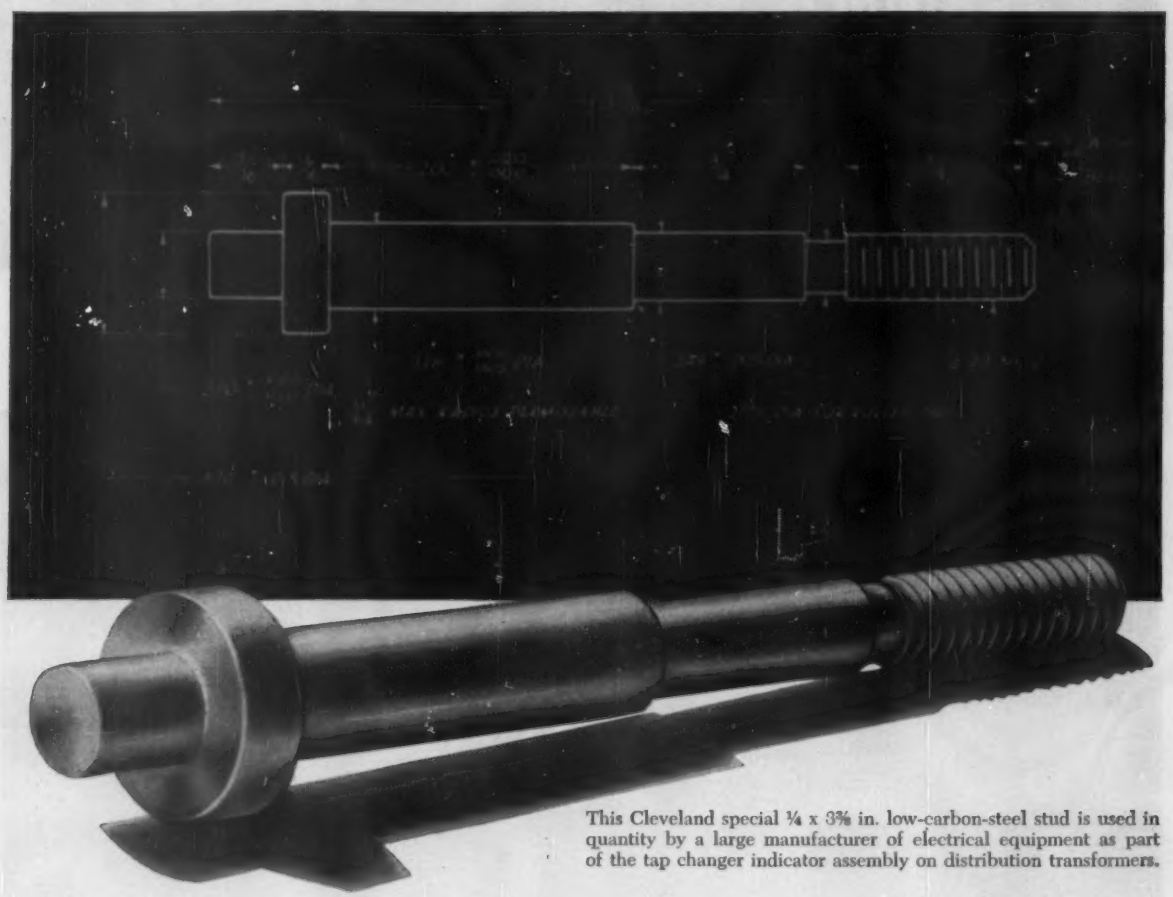
CLEVELAND SPECIAL HEADED AND THREADED PRODUCTS



This Cleveland special ¼ x 3⅜ in. low-carbon-steel stud is used in quantity by a large manufacturer of electrical equipment as part of the tap changer indicator assembly on distribution transformers.

Cost of special collar stud is cut 20% by Cleveland's cold forming techniques

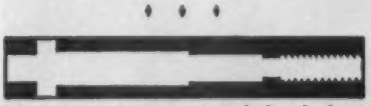
The famous Kaufman Double Extrusion Process which turns out millions of Cleveland precision cap screws yearly is highly adaptable to low-cost production of your fastener-type specials.

The tap changer stud pictured above is typical. Used by a well-known electrical equipment manufacturer, it was previously cut from bar stock. The special head, double shoulders, and groove above the threads meant numerous machining operations and considerable scrap.

Cleveland now cold forms this special stud at 20% less cost to the customer, while holding the specified .005 in. tolerance. And the part is stronger. In the head, threads and fillets, grain flow is symmetrical and unbroken. In addition, the forging action of the Kaufman process toughens surface metal while leaving the core ductile. Both fatigue resistance and tensile strength are thus increased.

We are regularly cold forming close-tolerance specials—many with unusual or extreme upsets—in large quantities. So whether your part is simple or complex, it will pay you to check with Cleveland, particularly at the design stage. There is an excellent chance that through cold forming we can cut the cost and improve the physical properties of the part you have in mind.

• • •

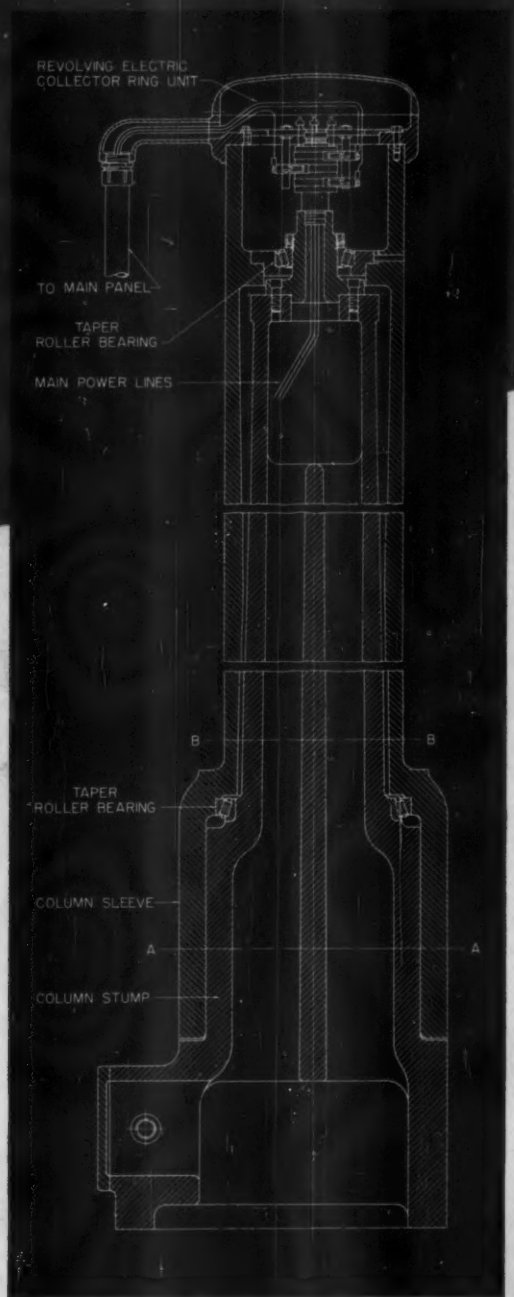


Black area represents metal that had to be cut away when stud was produced by machining. In the Cleveland cold forming process almost all the metal in the working slug is present in the finished part. The customer saves the difference.

Write for a copy of our folder "Specials by Specialists"

THE CLEVELAND CAP SCREW COMPANY
4444-3 Lee Road, Cleveland 28, Ohio

Rigidity Increased 50%



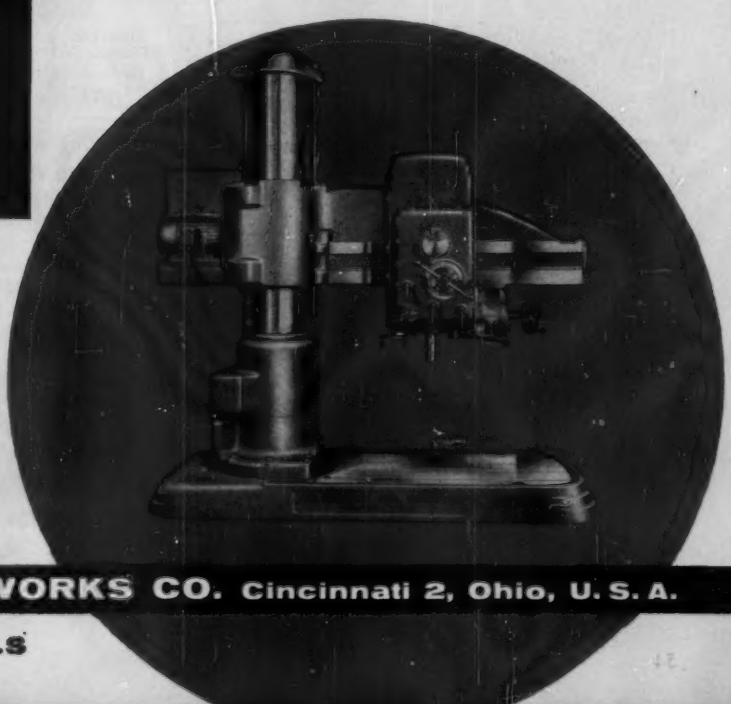
New thrust resistant, "TIMKEN" mounted column and sleeve assembly.

The new "TIMKEN" mounting of the column and sleeve on the new model 32-speed Hole Wizard Radial has hit the "jack-pot" for rigidity. It's the stiffest, most resistant column unit we've ever known.

Under drilling tests up to 30 horse power deflection has been cut in half over former models. It's truly a marvel of rigidity.

Large Timken bearings at top and bottom when preloaded bind the column and sleeve into the equivalent of a solid unit for resisting functional stresses and cuts arm deflection to an absolute minimum. This definitely results in greater accuracy and longer cutting tool life. To further increase resistance to stresses the column sleeve departs from conventional design by employing a tapered inner wall providing an unusually heavy section where the greatest functional stresses are concentrated.

A new "NON-CREEP" clamping mechanism in combination with a solid column sleeve cuff adds greatly to the rigidity of this new "AMERICAN" Radial.



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THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

Set No. 84

VK GEAR MEASURING WIRES

Illustrated above is the newest Van Keuren Gear Wire Set No. 84

Set No. 84 is a multi-purpose set designed to cover a range of 26 diametral pitches from 2 to 80 with wires from each of four different and popular wire series:— 1.92, 1.728, 1.68 and 1.44. Because of duplication of wire sizes, this set which would normally involve 104 sizes reduces to 84 sizes. The economy here is evident.

The latest VK Gear Measuring Tables, available in Catalog and Handbook No. 36, have been arranged for use with all four of these gear wire series. Thus the set can be used in conjunction with the tables in many ways, such as:

Tooth Thickness — Measuring *tooth thickness* of internal and external spur gears, splines and serrations.

Involute Profile — Checking *involute profile* by using more than one wire size. Series 1.92, 1.728 and 1.68 for externals. Series 1.68 and 1.44 for internals.

Helical Gears — Measuring *helical gears* when normal diametral pitch is one of the 26 for which the set was designed.

Enlarged Pinions & Reduced Gears — Measuring *enlarged pinions* and *reduced gears*. (tables are now available for the first time in VK Circular G38, giving measurement values and change factors for reduced gears which mate with pinions enlarged in accordance with the latest American Standard covering involute fine pitch gears).

Complete information regarding the use of gear measuring wires is contained in a fifty-page section of the VK Catalog and Handbook No. 36. Included in this section are the most complete gear measuring tables available, as well as all necessary formulas and equations for computing non standard spur and helical gears. Numerical examples are included. This book is available on request.

VK Gear Wires are held within .000025" for roundness and exact size. Surface finish is 1.5 RMS or better.

If complete coverage of all series is not necessary, sets covering single series such as 26 Ex. or 26 Int. are also available. See Catalog No. 36.

VK

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THE Van Keuren CO.,

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Optical Flats . . . Light Wave Equipment . . . Light Wave Micrometers . . . Gage Blocks . . . Wire Type, Taperlock and Trilock Plug Gages . . . Master Setting Disks . . . Thread Measuring Wires . . . Gear Measuring Wires . . . Carbide Plug Gages . . . Laps and Surface Plates . . . Precision Lapping Service.

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BAR and CHUCKING AUTOMATICS

...in the world's ONLY COMPLETE LINE of

1-4-6 and 8-SPINDLE machine sizes

National Acme's experience in the design and manufacture of more than 50,000 *single and multiple spindle bar and chucking automatics* provides complete line experience and versatility no other manufacturer can duplicate. It assures the RIGHT machine for your job. Of equal importance, it gives you experienced and responsible sales, service and engineering help—*when you need it.*

Write for literature giving full machine details:

Multiple Spindle CHUCKING Automatics—Catalog CH-51
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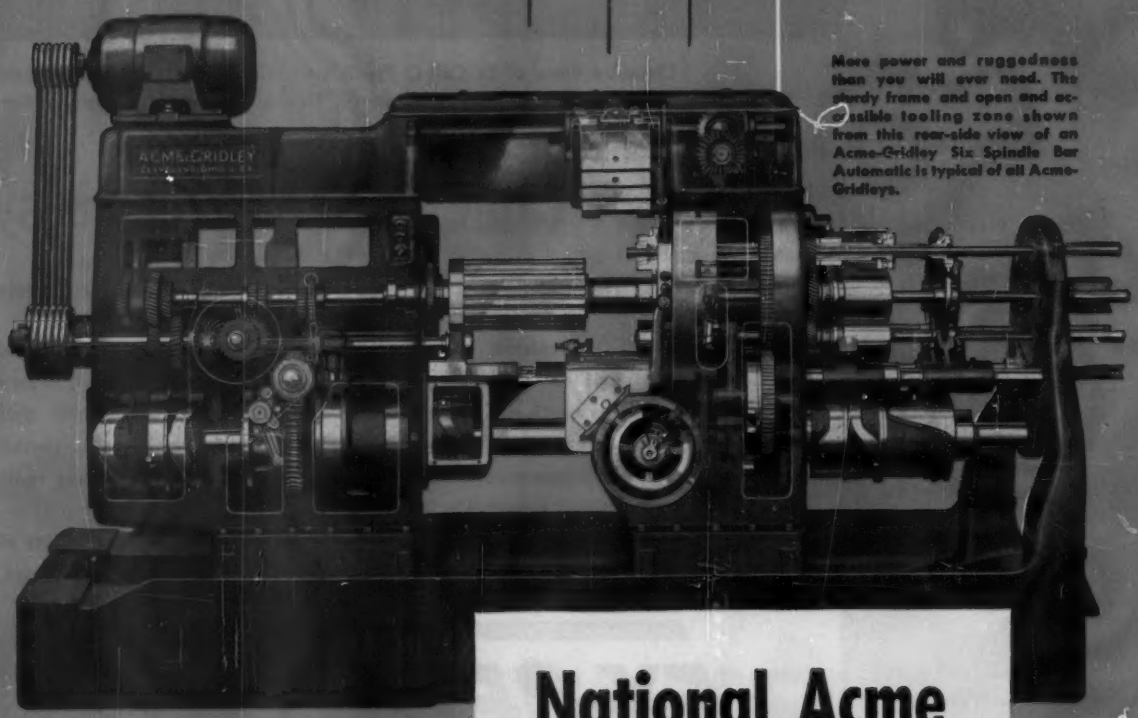
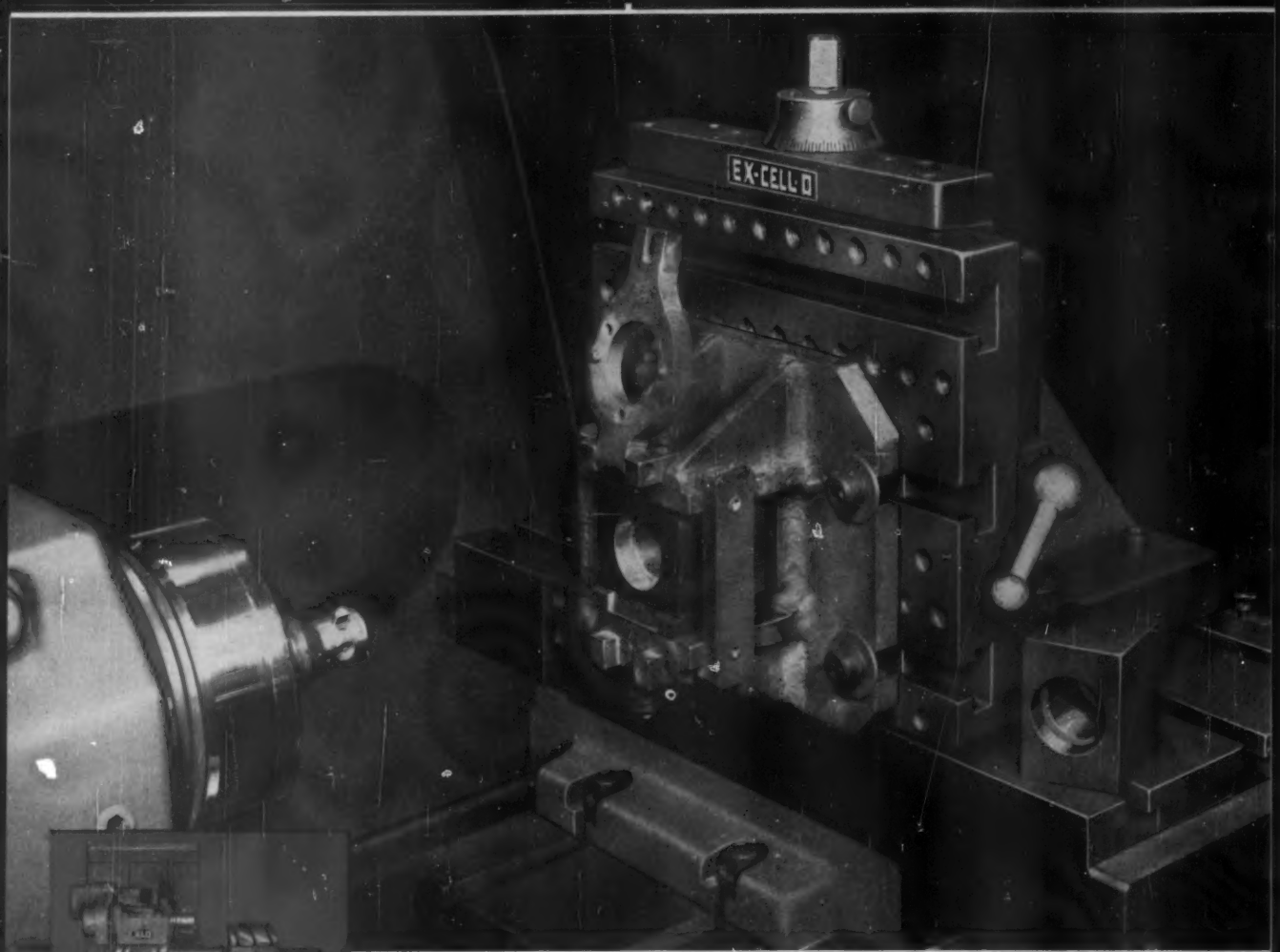
BAR MACHINES (9/16" to 7 3/4")				CHUCKERS (5 1/4" to 12")			
Number of Spindles				Number of Spindles			
1	4	6	8	1	4	6	8
3½"	1"	9/16"	⅝"	12"	10"	5¼"	6"
4¾"	1½"	1"	1¼"		12"	8"	8"
5½"	2"	1¼"	1⅜"			10"	
	2⅜"	1⅜"	2⅜"			12"	
	3½"	2"	4"				
	5½"	2⅜"					
	7¾"	3½"					
		4"					
		6"					



More power and ruggedness than you will ever need. The sturdy frame and open and accessible tooling zone shown from this rear-side view of an Acme-Gridley Six Spindle Bar Automatic is typical of all Acme-Gridleys.

National Acme

THE NATIONAL ACME COMPANY • 171 EAST 131ST STREET • CLEVELAND 8, OHIO



Close-up view of Ex-Cell-O Precision Boring Machine equipped with a single spindle and a universal fixture for small lot production.

2112-8 single-end Ex-Cell-O Precision Boring Machine with horizontal cross slide fixture.

1212-8 double-end Ex-Cell-O Precision Boring Machine with universal fixture having cross and vertical slides.

These versatile machines keep busy

Ideal machines for toolroom work and short production runs

These Ex-Cell-O Precision Boring Machines equipped for general-purpose work perform precision boring, turning, facing and chamfering operations quickly and economically.

They can be operated automatically or manually. Spindle speeds are easily changed through variable speed drives. Universal fixtures rigidly hold tools and workpieces of many sizes and shapes. Horizontal and vertical slides of the fixtures permit precision positioning of either tools or work.

Ex-Cell-O makes a complete line of versatile precision boring machines.

EX-CELL-O CORPORATION

EX-CELL-O FOR PRECISION

XLO

DETROIT 32, MICHIGAN MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

This Amazing New Limit Switch Operates Without Physical Contact!

Transducer (sensing head) is actuated by presence of magnetic materials over a wide range of sizes, shapes, weights, roughness, speeds

No moving parts. No metal-to-metal contact required for operation

Sensitivity up to 1 inch

Can be mounted in any position. Not affected by vibration

Small size (1⅞" x 6") Fits into tight spots

Non-magnetic material between the part and transducer does not affect operation

• Here's an entirely new concept in industrial limit switches! We've named it the **PROXIMITY LIMIT SWITCH** because it is actuated by the nearness of ferrous parts or materials. Since its operation requires no physical contact, it has unlimited applications in places where the use of conventional limit switches is either impractical or impossible! Its range of application is broadened, too, because the transducer (sensing head) is not affected by vibration or by the presence of non-magnetic material.

In paint spray systems, on production line presses, multiple process machines, heavy automation equipment—there are literally scores of places where this amazing new PROXIMITY SWITCH will do the job better!

ASK YOUR SQUARE D FIELD ENGINEER FOR A DEMONSTRATION. OR WRITE FOR PROXIMITY LIMIT SWITCH BULLETIN. ADDRESS SQUARE D COMPANY, 4041 NORTH RICHARDS STREET, MILWAUKEE 12, WISCONSIN

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!

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T-SLOT CLAMP

STEP BLOCK

SET-UP AND HOLD-DOWN TOOLS

ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down Tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

NON-SKID

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ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. ARMSTRONG AVE. CHICAGO 30, U. S. A.

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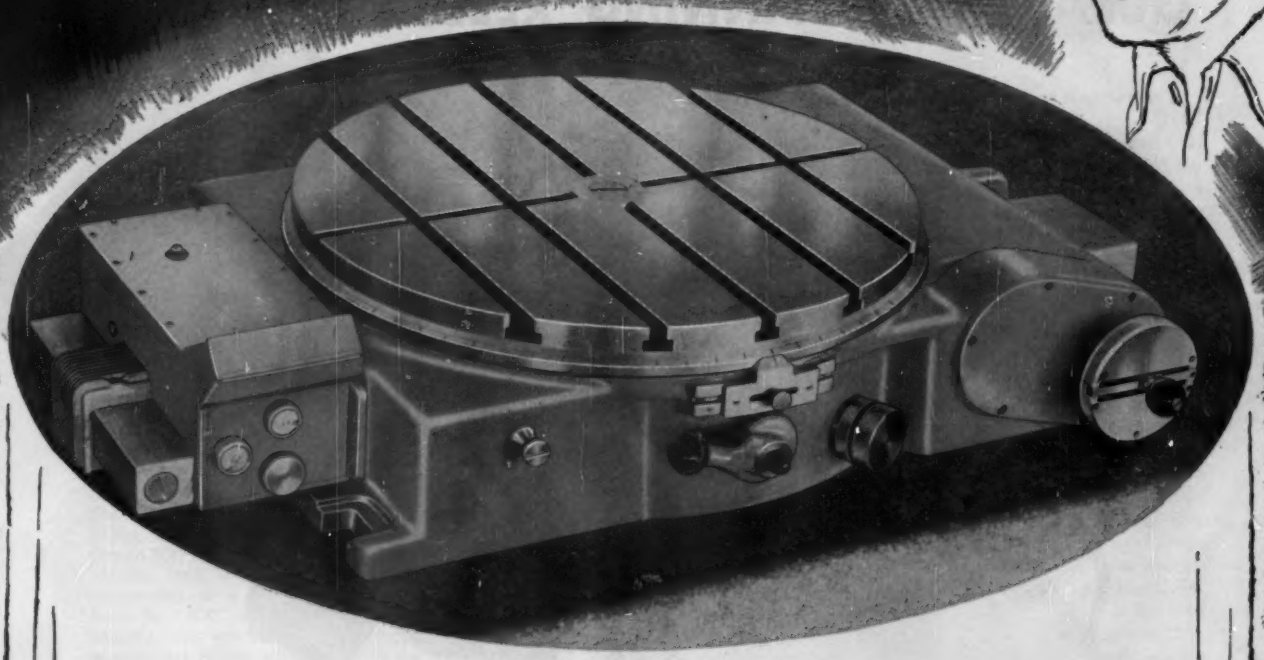
when you set THIS table . . .



because the new PRATT & WHITNEY 24" *Precision* PLAIN OPTICAL ROTARY TABLE gives direct settings to 1 SECOND OF ARC!

Equipped with an easy-to-read, projection optical system, this 24" Pratt & Whitney Precision Rotary Table provides the MOST CONSISTENTLY ACCURATE MEANS EVER DEVISED FOR PRECISE CIRCULAR SPACING AND ANGULAR POSITIONING. In addition, full 360° adjustment of the optical zero point makes it possible to establish the starting point *anywhere* without disturbing the workpiece. Reversible power rotation insures unequalled speed and ease of operation. Used with Jig Borers or other similar precision machine tools . . . or by itself for inspection or calibrating . . . this one-of-its-kind development will bring new standards of speed, accuracy, efficiency and economy to a wide variety of close tolerance manufacturing operations. For complete information and specifications, write for Circular No. 593. Pratt & Whitney Company, Incorporated, 11 Charter Oak Boulevard, West Hartford 1, Connecticut.

ONE IN A COMPLETE LINE OF P & W PRECISION ROTARY TABLES

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MACHINE TOOLS • GAGES • CUTTING TOOLS

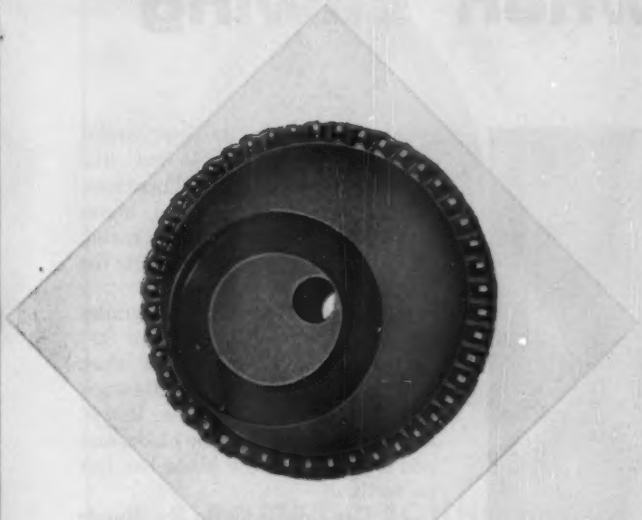
MUELLER BRASS CO. 600 SERIES BRONZE

the main working part in the smooth and OCEAN CITY SPINNING REELS

600 Series gears prove ideal in heavy duty salt water models 300, R300, and 320 in which corrosion resistance and high strength are important.

Other typical "600" applications

FORGED GEAR powerful



The Montague-Ocean City Rod & Reel Co. of Philadelphia is proud of the fact that many fishermen are calling their famous Ocean City "300" series spinning reels "the most dependable spinning reels in America." Such praise justifies the very best components in a product—like the corrosion-resistant Mueller Brass Co. "600" alloy gear. Provides its own shaft and has an integral clutch which takes the driving force from the handle, and incorporates a cam which provides the oscillating motion of the spool for cross-winding the line. Bronze was chosen because of the need for maximum strength, long wear, and because it is such an excellent bearing material. This application dramatically points up the valuable properties of Mueller "600" series alloys.

There are countless applications of Mueller "600" series bearing alloys. Find out how you can utilize one or more of them in YOUR products. Because forgings can be made closer to the finish size in "600" series alloys than can sand castings, there is less waste, greater speed in finishing.

• WRITE TODAY FOR THE ENGINEERING MANUAL YOU NEED

Mueller Brass Co. Forgings Engineering Manual H-58565 ☐

Tuf Stuf Aluminum Bronze Alloys Engineering Manual H-58563 ☐

600 Series Bearing Alloys Engineering Manual FM-3000 ☐

Copper Base Alloys in Rod Form Engineering Manual FM-3010 ☐

MUELLER BRASS CO.

PORT HURON 24, MICHIGAN

199

METALS AND ALLOY REVIEW

by FRANK M. LEVY

Vice-President and Director of Research

Recently Ray Engelgau, who heads our statistical quality control procedures, and Amos Armitage from our machining department met in my office and we had a very interesting discussion on our new "S-C" rod. The term "S-C" is derived from the fact that it is produced from billets that are cast semi-continuously. In addition, we use the letters "S-C" to indicate its "super cutting" qualities which is one of the outstanding characteristics of this rod. We have definitely proved these qualities in some very exhaustive tests, one of which I'd like to tell you about here.

Experience has shown that it is difficult to control dimensions within close tolerances on machine parts involving internal forming operations. Amos had run into exactly that trouble with a certain hydraulic fitting made from rod that required a fairly close dimensional tolerance on the internal formed diameter. So, we decided to make a comparison test by machining the part from rod made by the conventional method and from rod produced by the S-C process. When rod made by the conventional method was machined, the parts could not be held within the specified tolerance range. The same machine, the same tooling and the same machine operator were used in this test, and when S-C process rod was substituted, the machine parts were well within the required tolerance range.

In addition, I just received a letter from a well-known equipment manufacturer who has been running tests on S-C rod. They reported that the incidence of tool trouble per 1000 forgings machined from S-C rod were approximately half that of forgings made from conventional rod. We think that is pretty good evidence that the rod made by our semi-continuous process is exceptionally uniform by all standards. Incidentally, our new billet casting department is quite a model of automation and has a number of interesting processes and features. Anytime you happen to be in our area we would be more than happy to show you through and explain the many points of this process that gives us what we firmly believe to be the best possible rod available today which of course is reflected in the quality of our forgings.

If you would like a folder that fully covers our semi-continuous process, just drop me a note and I'll see that one is sent along to you promptly. In the meantime, we'd like to have you investigate our super-cutting S-C rod because we think it will improve your product quality—and we've got the alloys to do most anything to meet the most exacting demands.

Thanks for your time.

Stainless Steel
cutting information . . .

*Don't dawdle when sawing

SOME MACHINISTS (the slow, careful type that are so hard to find) like to saw metal very slowly. These men remember old instructions about overheating the blade or the metal, and they worry about destroying the "temper."

Not so with the austenitic grades of Stainless Steel (like the 300 series). These steels harden when they are worked. If you dawdle when sawing one of these steels, it will harden right ahead of the blade, and you'll swear the saw blade has lost its teeth.

All this talk leads to the simple suggestion: When sawing Stainless Steel, use the recommended speed and cut boldly, without dawdling. It will save time, tempers and saw blades.

Stainless Steel fabrication is not difficult, but it *is* different. So why not have the last word in fabrication techniques right in your desk? Write on your company letterhead for a copy of our 130-page "Stainless Steel Fabrication Book." Address United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

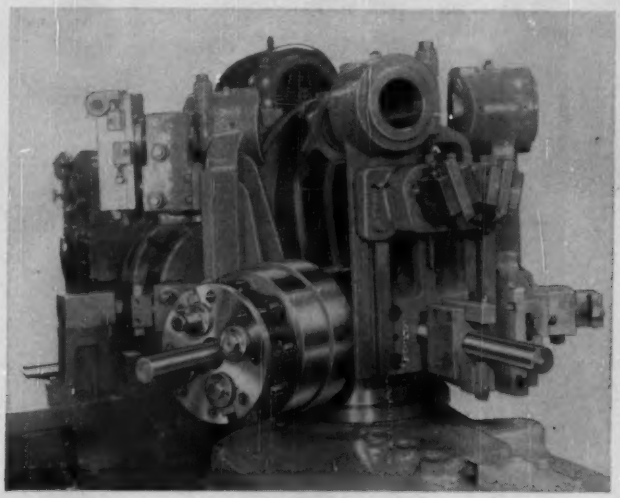
USS STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS
PIPE · TUBES · WIRE · SPECIAL SECTIONS

UNITED STATES STEEL

USS

Passes Stiff Production Test with NO BAD MARKS !



- **A POTTER & JOHNSTON 6DRE-40 AUTOMATIC . . . does the job quickly, economically.**
- **P&J-ENGINEERED TOOLING . . . insures fine finishes with NO RETURN TOOL MARKS.**

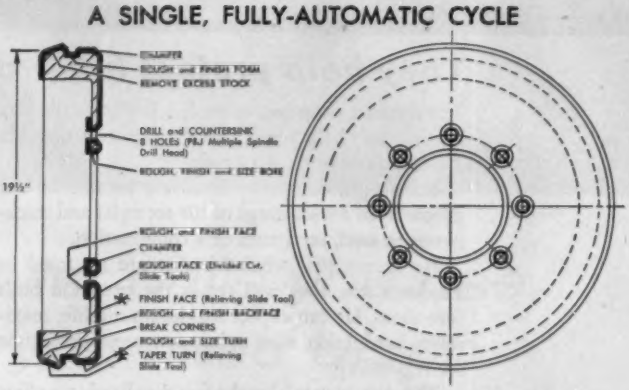
Job Facts:

THE PART: Cast iron tub bottom.

REQUIRED: 26 separate roughing and precision finish cuts including: 2 critical surfaces to be machined without return tool marks . . . and 8 holes on a diameter to be drilled and countersunk.

MACHINING: Finished in just 8½ minutes per piece . . . *floor-to-floor time!* Use of relieving slide tools eliminated return tool marks; a P&J Multiple Spindle Drill Head handled all 8 holes simultaneously; no need for a secondary operation; extensive use of standard, basic tools throughout the entire setup kept tooling costs to an absolute minimum.

A SINGLE, FULLY-AUTOMATIC CYCLE



HEAVY LINES INDICATE MACHINED SURFACES

Several factors — the number and complexity of the cuts involved, the high accuracy and fine finishes required, and the speed with which these pieces are produced . . . make this an unusually interesting job. But remember, performance like this is the rule — not the exception — when you team a Potter & Johnston Automatic Chucking Turret Lathe with P&J Tooling. Here is a winning combination that can help you improve quality, increase output and cut costs on your toughest jobs. Send now for complete information on the 6DRE-40 and the other Automatics in the complete P&J line. Write to us direct . . . or phone the Pratt & Whitney Branch Office near you for a Direct-Factory Representative to discuss your requirements. *Potter & Johnston Company, Pawtucket, Rhode Island (Subsidiary of Pratt & Whitney Company, Inc.).*

POTTER & JOHNSTON

Precision Production Tooling for more than Fifty Years

AUTOMATIC TURRET LATHES • NEWARK GEAR CUTTERS

Why the Contract Shop Owner Prefers PRODUCTO Die Sets

They help protect his profits

The contract shop owner prefers Producto die sets because they help protect his die performance...his delivery promises...his profits.

The shop owner favors Producto because he can choose from a wide range of die set styles and thicknesses in steel, semi-steel or a combination.

He knows that when his dies are mounted in Producto sets, they will retain the precision built into them. He can expect maximum die life, maximum production with minimum press downtime for regrinding.

The shop owner likes the fact that Producto offers him a choice of two classes of precision, and that *he pays only for the amount of precision he buys.*

He knows that whoever handles the die will spend the least possible time taking it apart and putting it together because Producto's Qwik-Fit Guide Pins minimize die set assembly problems.

Most important, the shop owner can depend on efficient Producto service and strategically-located Producto distribution centers to protect the delivery promises he makes to *his* customers.

When the contract shop owner thinks in terms of protecting his profits, he thinks of Producto die sets and accessories. You should, too.

NEW DIE SET CATALOG No. 11 is another reason the shop owner prefers Producto. It makes selection and ordering really easy. Write for your free copy today. And ask to receive Die Set Digest, too.

THE PRODUCTO MACHINE COMPANY
975 Housatonic Ave., Bridgeport 1, Connecticut

Wherever die sets are used

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PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

If you use twist drills as fast as some folks chain smoke...

This brand cuts down your drill usage, product time and costs!

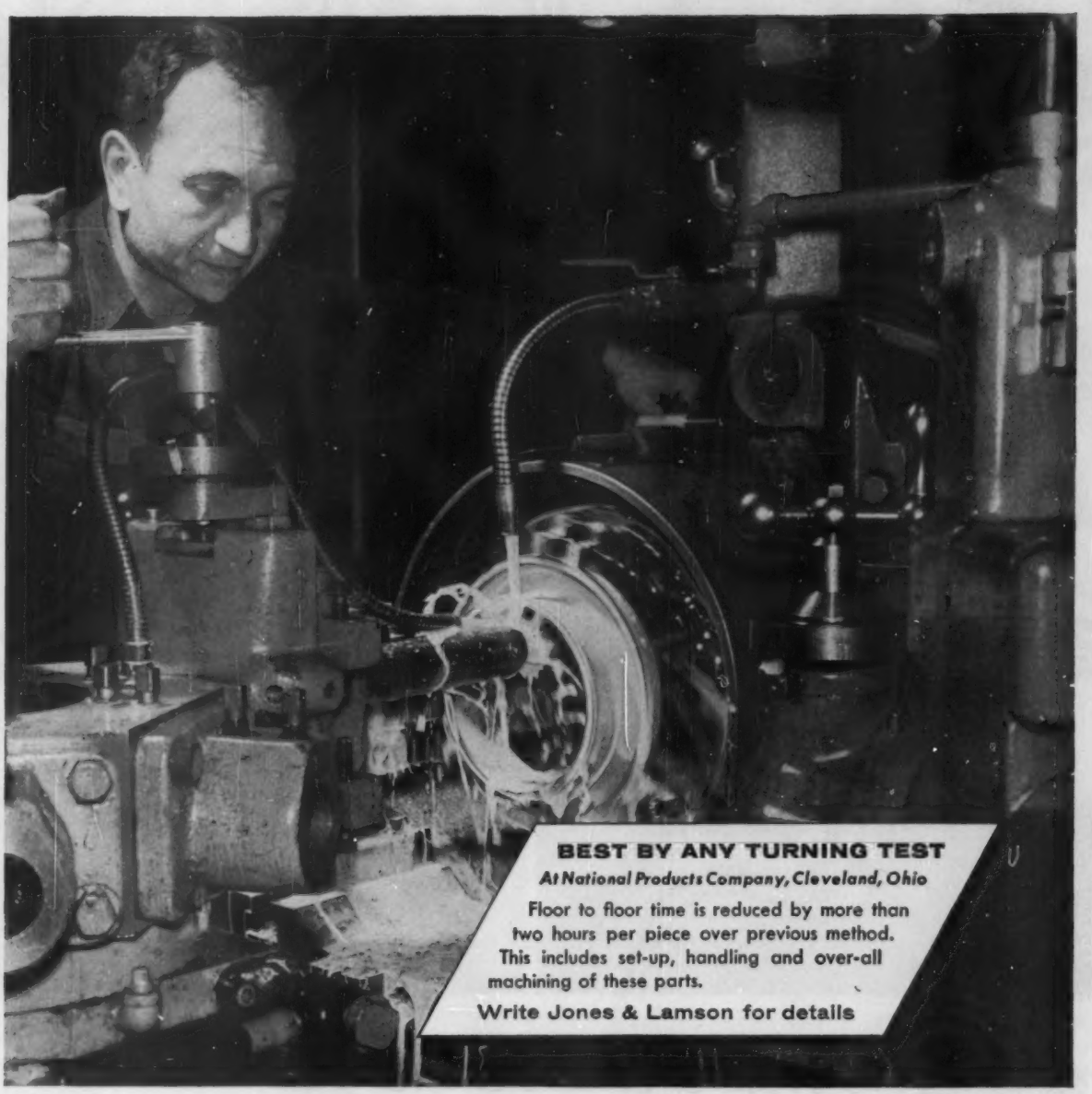
The more twist drills you use, the more you need Union

Union also manufactures milling cutters, gear cutters, hobs, reamers and carbide tools. Available nationally through Union warehouses in Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City, and San Francisco. S. W. CARD DIVISION, Mansfield, Mass.; BUTTERFIELD DIVISION, Derby Line, Vt.

UNION

TWIST DRILL COMPANY, Athol, Massachusetts

See Your UNION DISTRIBUTOR for cutting tools that will save you time and money

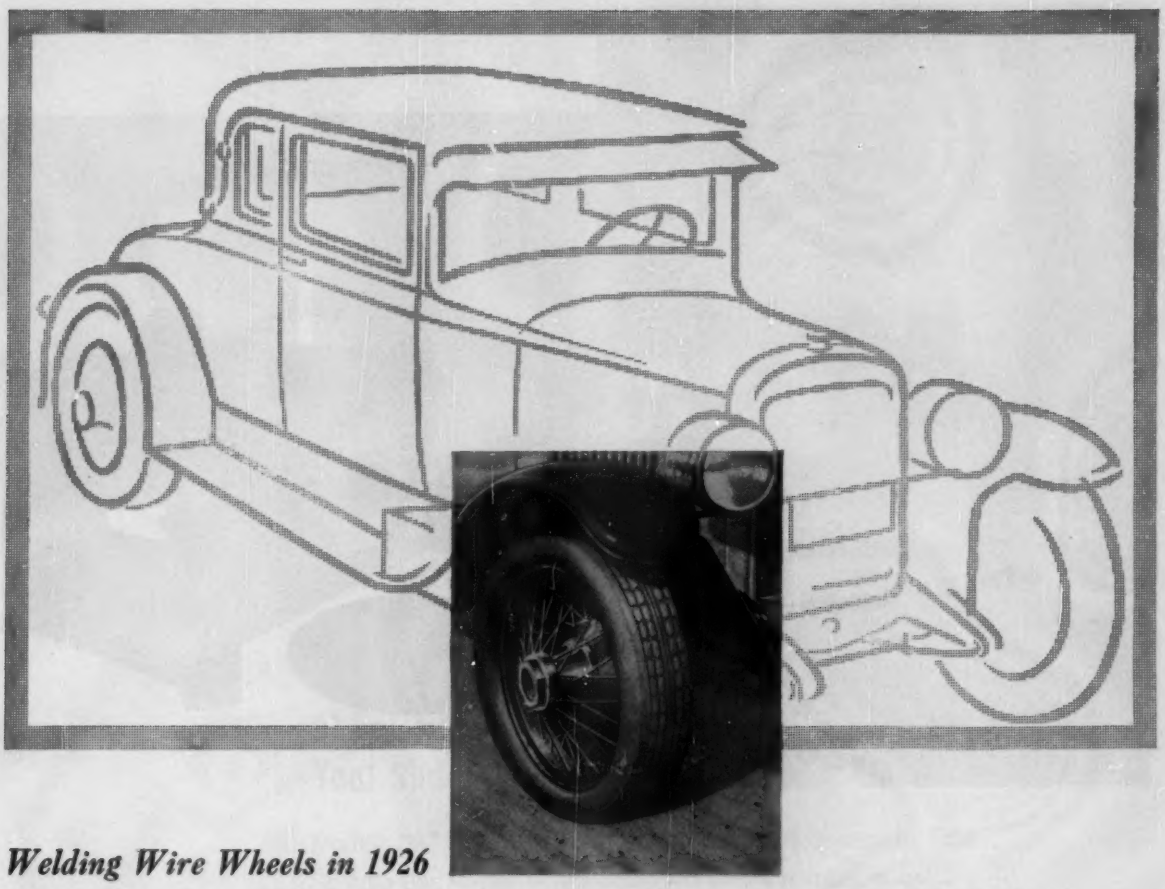

BEST BY ANY TURNING TEST
At National Products Company, Cleveland, Ohio
Floor to floor time is reduced by more than two hours per piece over previous method. This includes set-up, handling and over-all machining of these parts.
Write Jones & Lamson for details

Jones & Lamson turret lathes are built and powered to produce *MORE CHIPS per tool*
MORE PIECES per hour
MORE PROFIT per job
than any other turret lathe of comparable size!

JONES & LAMSON

the man who needs a new machine tool is already paying for it

JONES & LAMSON MACHINE COMPANY, 502 Clinton St., Springfield, Vt., U.S.A. J&L MACHINE TOOL DIV.



Welding Wire Wheels in 1926

Helped MALLORY Learn Better Ways to Solve Your Welding Problems Today

THIRTY YEARS AGO, a leading auto manufacturer (still a leader today) ran into a serious production bottleneck in resistance welding of wire wheels. The copper dies being used wore out so quickly that costs were too high, production too slow.

Elkonite®, a material developed by Mallory, looked promising for this application. It was tried . . . and the results were excellent. Die life increased tenfold. And production was freed of stoppage troubles.

This development marked Mallory's entry into the resistance welding field. It has been followed, in succeeding years, by a continuous stream of contributions to welding technology. These are some of the major milestones in Mallory progress:

Specialized alloys, like Elkaloy® A, Mallory 3, Mallory 22 and many others, which provide a family of materials engineered for the specific needs of welding service.

Fluted electrodes, which greatly increase electrode life.

Cold forming methods for producing bent electrodes with greater hardness and strength.

Special holder designs to meet the needs for higher pressures for large welding machines, and low pressures for non-ferrous alloys.

The knowledge gained during three decades of pioneering activity and constant development stands ready to serve on your own resistance welding problems. Write or call Mallory for a personal consultation by a Mallory welding engineer . . . and see your local Mallory welding distributor for prompt delivery of the best in welding electrodes, holders, seam welding wheels, forgings and supplies.

In Canada, made and sold by Johnson Matthey & Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario.

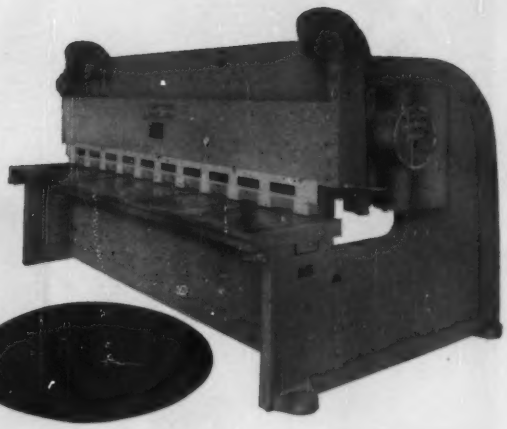
For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio.

30 Years of Welding Progress

P. R. MALLORY & CO. Inc.

MALLORY

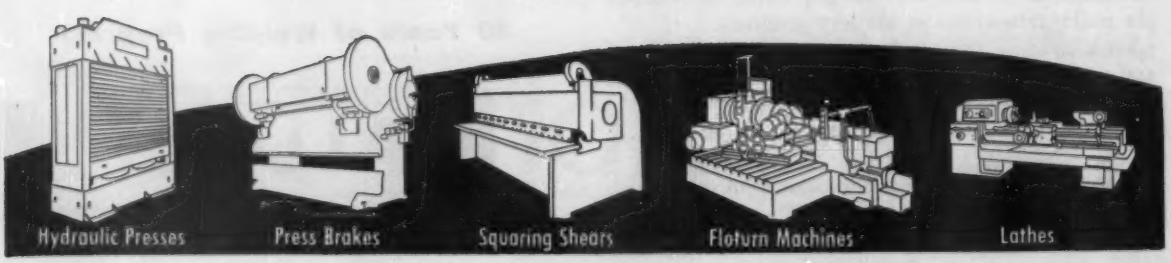
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA



keep your
shear operators in the
production zone

WITH A LODGE & SHIPLEY POWER SQUARING SHEAR

There's one thing for sure about shearing.
Keep the operator out front for maximum production!
That's why one user calls the space in front of his Lodge & Shipley Shear the "Production Zone." With all adjustments in front and all clear behind the shear, the operator stays out front and on top of the shearing job. Necessary adjustments can be made quickly . . . scrap or cut pieces can be removed from the back of the shear by hand, truck or even conveyor.
There are, of course, many other productioneered features in the New Lodge & Shipley Shears. For details, write for Bulletin PS-8:
The Lodge & Shipley Co., 3056 Colerain Ave., Cincinnati 25, Ohio

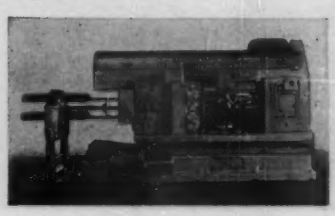


Conomatics Provide Radial Screw Adjustment of Forming Tool Slides

Models 2⅝" LA, 3½" AD, 5" KL, and 5¼" KR Conomatic Four Spindle Bar Machines are equipped with a number of quick job-change features. One of these is the all-position end attachment drive for the mounting of endworking opposed spindles in all positions, with independent feed to as many as three opposed spindles on a single setup.

Another feature that is of considerable importance in tooling up is the radial screw adjustment of all sideworking slides. Trial cuts may be taken to correct diameters with form tools without changing the clamped positions of the form tool holders.

All Conomatic quick changeover models are equipped with dial adjustment of the working stroke of all tool carrying slides. Besides the Four Spindle machines there are three quick change Six Spindle models in 9/16", 1" and 1⅝" sizes.
Write, wire, or phone for literature.



Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U. S. A.

dixi 60

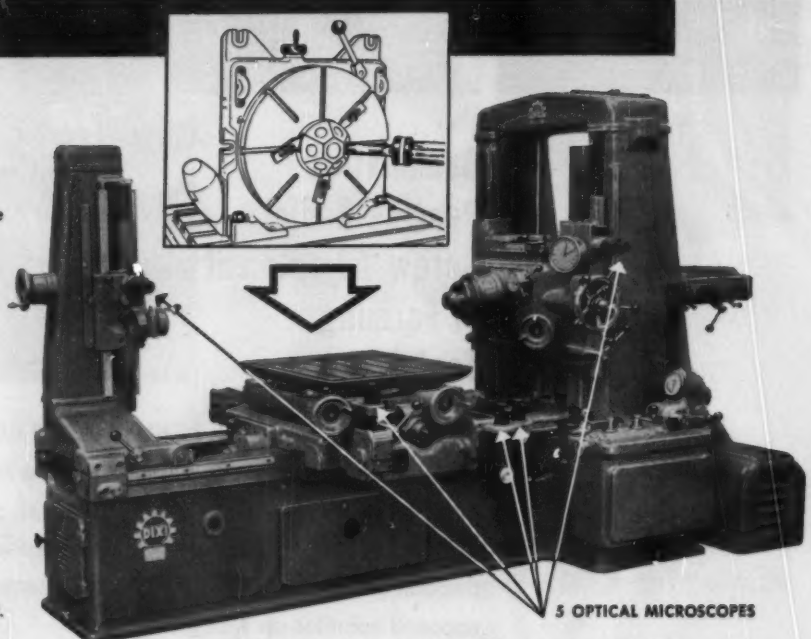
horizontal optical jig borer

with 5 optical microscopes

DESIGNED AND BUILT FOR:

VERSATILITY
Optical settings for operations in all planes and compound angles . . . Equally suitable for tooling, short-run or production work . . .

ACCURACY
Overall accuracy of .0002"



A precision machine for *JIGLESS* boring, facing, milling, and drilling work, in all planes. Built-in 360° optical rotary table, 28¾" x 32⅝". All spindle and table settings by optical microscopes. Infinitely variable hydraulic feeds. Mechanical spindle feeds with automatic depth stop. #40 taper spindle-speeds infinitely variable to 1400 R.P.M. Special features eliminate effect of spindle overhang on accuracy.

DIXI 450 PRECISION OPTICAL CIRCULAR DIVIDING TABLE

Direct readings of 1 sec.

(See insert picture above) rigidly mounted (not tilting) on built-in rotary table permits holding close tolerance relations between bores in all planes, including bores at compound angles. ALL IN ONE SET-UP. All sides of the work piece except the mounting face machined in one set-up.

- ***Guaranteed service by factory trained staff***
- ***Engineering staff available for consultation***
- ***Spare Parts in New York stock***
- ***Your operators trained***

DIXI 60 now in wide use in leading Aircraft and Manufacturing Plants throughout the United States.

Names available upon request.

SEE THIS VERSATILE MACHINE IN OPERATION

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IF YOU NEED *VIBRATIONLESS* GEARS IT'S A JOB FOR G.S. PATENTED GROOVES

G. S. research has now *overcome vibration and flutter* in Small Gearing for many vital applications. G. S. PATENTED GROOVES, as pictured here, successfully insulate vibrations of worm and gear teeth from reaching the shaft. Ultra smooth, *noiseless* operation is more than ever assured by the use of Bakelite Gears. ★ Whatever YOUR Gearing problem, you can depend upon G. S. research and engineering to lend powerful aid in reaching a successful solution. Here, you can, *without cost or obligation,* draw upon experience gained through 40 YEARS of specialization in the design and mass production of better Small Gearing exclusively. Send drawings and particulars today. Get the ONE best and most economical application for the job!

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Another example

W-1138

W 1139

# of Blanchard versatility

No. 303 Stainless Steel Forging

653 oddly shaped, non-magnetic workpieces

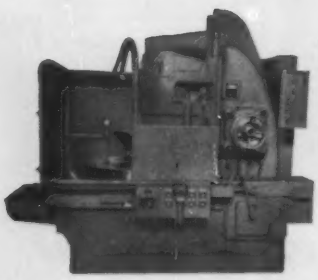
Blanchard Surface Grinders are noted for their unusual versatility—like grinding small, non-magnetic stainless steel forgings in quantity.

In the first operation, 653 forgings are loaded and blocked between rings on a No. 18 Blanchard, with 36" magnetic chuck (stock removal .010"). Parts, chuck and rings are sprayed with oil, and molten sulphur is poured around the parts to hold them. After grinding, the sulphur is easily stripped away.

This entire operation takes only 1½ hours—including preparation of the sulphur.

In the second operation, 44 pieces are set in a notched steel ring. Tilting the wheelhead and maintaining wheel pressure in one direction holds these non-magnetic pieces in the notches. Stock removal from this surface is .030", to tolerance of ±.003. Each load takes eight minutes—floor-to-floor.

As a result of this ingenious workholding, each piece is ground on both sides in a fraction of a minute, at less than 98¢ abrasive cost for all 653! That's typical of the convenience and economy of grinding on a Blanchard—whether the parts are magnetic or non-magnetic!



Send for free copies of "Work Done on the Blanchard", 4th edition, and "The Art of Blanchard Surface Grinding", 3rd edition—recently revised.

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

THE MONARCH RIGHT ANGLE IS YOUR BEST ANGLE

. . . for the turning, boring, and facing of thin-walled work pieces having large diameter and short length.

Here's a specialized chucking machine for optimum output—for every plant producing this type of work in sufficient volume.

For instance: large metal gaskets—large refrigerator compressor discs—miscellaneous disc and ring work—specialized mold work—tire rings and mold shells for tire manufacturers—large diameter housings. And, of course, jet engine components such as discs, wheels, rings, spacers, vane assemblies, shrouds, and so on.

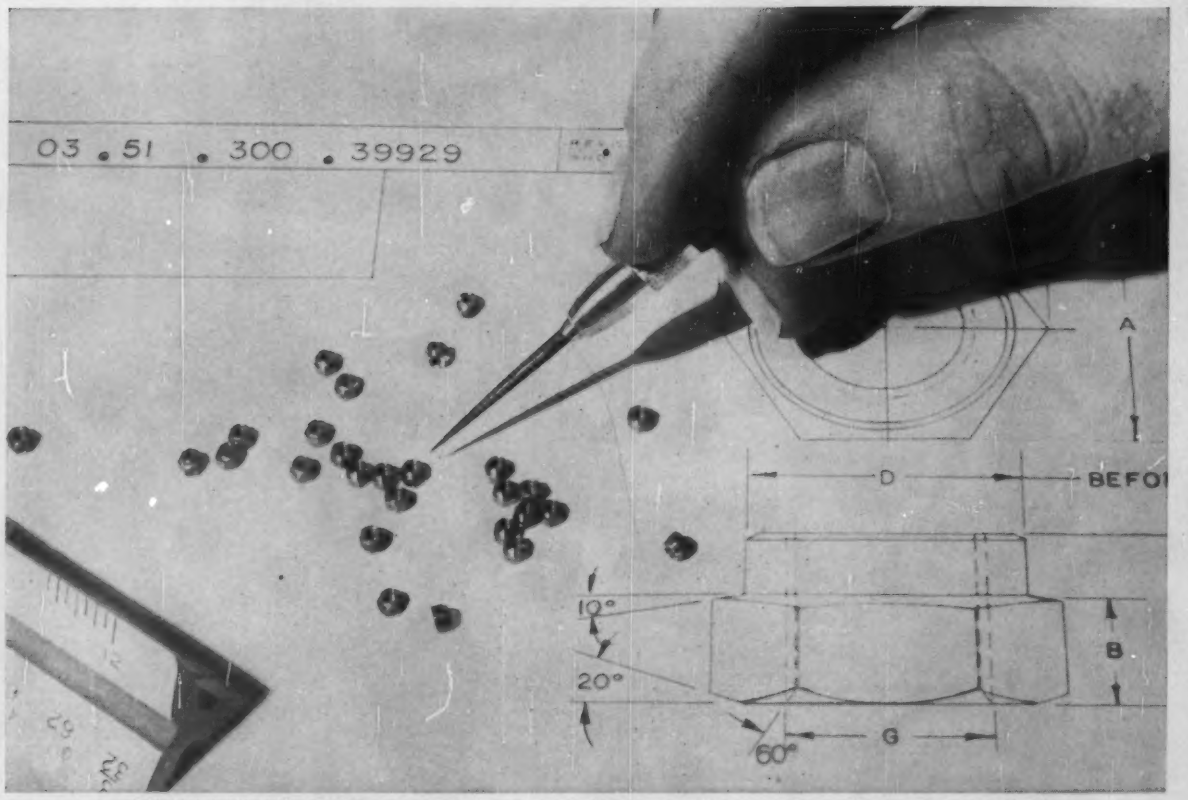
Specifically, you get such Monarch specialties as Air-Gage Tracer controls, completely automatic turning cycle with push button control, power angular feed, in-built constant surface cutting speed on the Model F (principally for facing), and dual slides on the Model O (principally for turning and boring).

Monarch Right Angle Lathe, Model O.
Swing in gap—60". Maximum turn diameter—48".
Maximum work width—12". Motor size—20 H.P.

All the features and uses of this machine would fill a book. They do, and we have it. Just ask for Booklet #1401 . . . . . **The Monarch Machine Tool Company, Sidney, Ohio.**

Monarch
TURNING MACHINES
ACCURACY • ECONOMY • LONG LIFE

FOR A GOOD TURN FASTER...TURN TO MONARCH



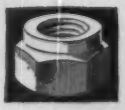
FLEXLOC MICROSIZE locknuts meet designers' needs for tiny precision nuts that retain strength and holding power in the smallest assemblies—servomechanisms, electronic and electrical equipment, all miniature devices.

New FLEXLOC Microsize Locknuts

Now available in Alloy Steel, Stainless Steel, Brass and Aluminum for lighter, more compact designs

SIZE	Across Flats		Shoulder Height		Across Corners	Height +.000 −.003
	MAX.	MIN.	MAX.	MIN.	MIN.	
0-80 NF-3B	.111	.107	.047	.042	.123	.075
1-64 NC-3B	.127	.123	.0635	.0585	.141	.090
1-72 NF-3B	.127	.123	.0635	.0585	.141	.090
2-56 NC-3B	.158	.153	.068	.063	.176	.105
2-64 NF-3B	.158	.153	.068	.063	.176	.105
3-48 NC-3B	.190	.183	.071	.066	.210	.120
3-56 NF-3B	.190	.183	.071	.066	.210	.120
4-40 NC-3B	.190	.183	.072	.067	.210	.120
4-48 NF-3B	.190	.183	.072	.067	.210	.120

SPECIFICATIONS: Available in brass (plain or cadmium plated) and aluminum (plain or chemically treated), for temperatures to 250°F; alloy steel, 18-8 stainless, for temperatures to 550°F.



New FLEXLOC Microsize locknuts are smaller and lighter than regular FLEXLOCS of the same nominal diameter. Wrenches of smaller size are used to install them. Mating joints or flanges can be designed smaller—with no loss in strength or convenience of assembly.

Microsize FLEXLOCS have all the advantages of larger FLEXLOCS. One-piece, all-metal construction—nothing to put together, come apart, lose or forget. Use them as lock or stop nuts—they stay put anywhere on a threaded member as soon as the locking threads are fully engaged. Uniform locking torques insure accurate preloading. There are no nonmetallic inserts to pop out or deteriorate. Moisture, dryness, oil won't affect these Microsize FLEXLOCS. Just screw them on. They lock and stay locked. Vibration won't shake them loose.

For complete information on Microsize FLEXLOCS, consult your authorized SPS distributor. Or write STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

STANDARD PRESSED STEEL CO.

FLEXLOC LOCKNUT DIVISION SPS JENKINTOWN PENNSYLVANIA

12 spindle speeds, instantly selected with direct-reading, color match dial.

All-geared spindle drive transmission.

Totally enclosed quick change gear box. 48 or 54 thread-feed changes.

Ground and flame hardened bedways insure years of accurate service.

Hardened steel gears in all 3 transmissions assure long-life operation.

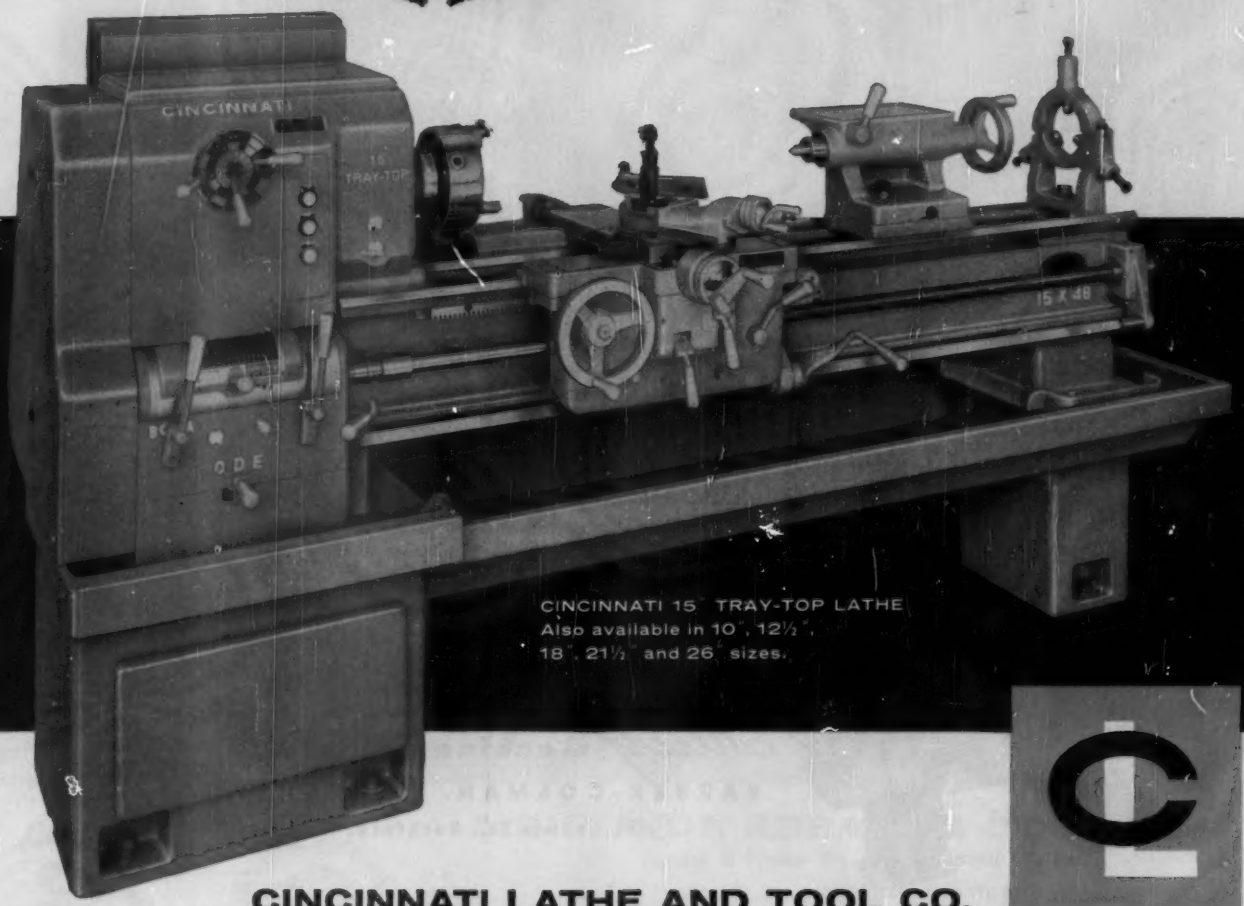
Fully enclosed electrical controls increase operating ease and safety.

Tray-Top Lathes give you many other features normally found only on larger, more expensive lathes. For all the facts and features, see your Cincinnati dealer. Send today for catalog data.

Because it's a

CINCINNATI
TRAY-TOP LATHE

more goes into it...
you get more out of it!



CINCINNATI 15" TRAY-TOP LATHE
Also available in 10", 12½", 18", 21½" and 26" sizes.

CINCINNATI LATHE AND TOOL CO.

3207 Disney Street, Cincinnati 9, Ohio

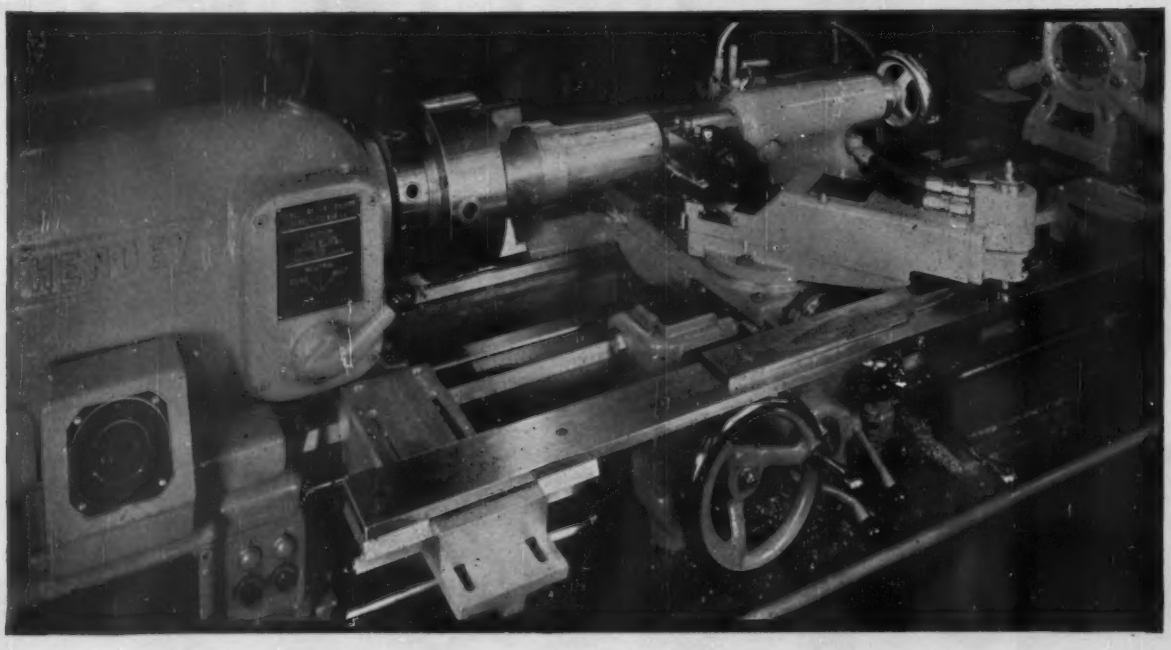
Builders of Engine, Toolroom and Fixed Gap Bed Lathes and a Complete Line of Drilling Machines

You get

top value per dollar

with a Hendey No. 2E lathe

QUICK-CHANGE tracer attachment
CUTS CONTOUR TURNING COSTS!



The precision performance and fast, easy setup of the new hydraulic tracer control introduce previously unheard-of economy wherever three or more pieces are to be step-turned. Available as optional equipment, the new tracer is a packaged unit which simply replaces the standard compound . . . no drilling required. Mounts on front of lathe where the flat template stays clear of chips and coolant.

The Hendey No. 2E is widely known as the multi-feature lathe offering top value at moderate cost. Electronic drive with fingertip stepless speed control gives unmatched ease of precision production and makes the Hendey No. 2E ideal for hydraulic tracer control. Contact your Hendey dealer for details and specifications.

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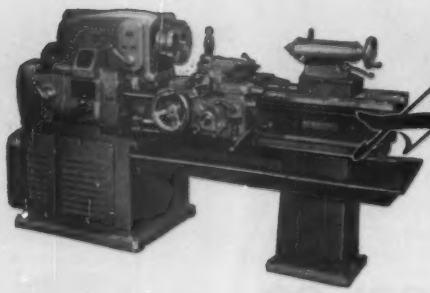

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NOW for heavy duty grinding . . .

you can have the fast cutting action of a softer grade with long life of a hard wheel

Available with Red Streak Flanges — for metal to metal fit on mounting equipment — another Simonds Abrasive exclusive.

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Try SIMONDS ABRASIVE CO. SNAGGING WHEELS with New IL BOND

It's in the wheel mix! Special chemicals and compounds added to conventional resinoid bonds provide an internal lubricant which increases the abrasive cutting action—yet retains long wheel life.

IL bond gives a distinctly different grinding action on semi-automatic and regular swing frame grinders, on floor stands and portables. IL bond in harder grade will give longer life if your present cutting rate is satisfactory, and IL bond in the same grade will increase cutting action if your present wheel life is satisfactory. Write for descriptive bulletin.

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An almost perfect balance of *toughness, wear resistance* and *heat resistance* gives duMONT Tool Bits a definite edge in cutting life, gives you more cuts per bit, more cuts per dollar.

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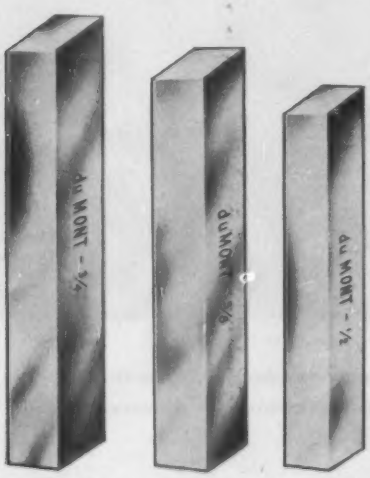

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Die Designers

Mr Cope's article, "What Die Design Training Needs," (*AM*—Nov 19 '56, p170) advocates the formation of a committee to ". . . break down each type of (die) operation by definite principles, write a full explanation of its uses, advantages, and limitations."

This sounds like a great idea! But apparently Mr Cope has not been reading *American Machinist* during the past year. If he had, he could not possibly have missed Mr J R Paquin's outstanding series, "14 Steps to Design a Die." Even a cursory examination of this material by Mr Cope would reveal that Mr Paquin has been doing, for well over a year, exactly what Mr Cope belatedly proposes.

In a series of brilliant illustrations (237 to date, by actual count) Mr Paquin has 'broken down each type of die operation (covered so far) and written a full explanation of its uses, advantages, and limitations.' A previous series of articles by Mr Paquin, published in *AM* in 1949 and 1950, did the same for other phases of die designing (194 illustrations for that series by actual count). And all this with scarcely a committee member around!

Bruce Heaton
Worcester, Mass

That we agree with reader Heaton's evaluation of the series by Mr Paquin is indicated by the fact that we published his articles (and will continue to do so as fast as they become available). At the same time, we would remind reader Heaton of the brilliant series of 29 articles by Mr Cope on draw dies (AM—Aug 3 '53, p110 et seq). Both men are leaders in tackling this problem—and both are published by AM.—Ed

Wasn't I Right?

I wrote you some time ago (*AM*—June 4 '56, p98) about how wrong it was to throw away carbide toolbits, even if they were of the so-called throw-away type. Then you published a letter from John J English, Detroit (*AM*—Aug 27 '56, p68) saying, in effect, that I was a miser and should be satisfied to get my money's worth of cuts out

SHOPMATES

N. Jarvis

I SEE IT!! BUT I DON'T BELIEVE IT!! IS THAT A SCULPTURE OR WHAT ??
HE'S GOT MORE ANGLES THAN A LAWYER ON AN AMBULANCE CASE-- AND THE FARTHER HE GOES, THE HARDER IT IS TO QUIT...
I JUST WANTA SEE HIM MOVE THAT MESS TO THE MILL TABLE!!
... HE STARTS FIGGERIN' WAYS TO GET THE BUILDIN' ON A ANGLE AN' I'M LEAVIN'!!
N. JARVIS

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Women Work Well with LELAND-GIFFORD Drilling Machines

At the dexterous finger touch of skilled women operators, these rugged he-man Leland-Gifford Drilling Machines perform miracles of precision drilling for Teletype Corporation.

Thousands of small precision parts for intricate Teletype machines require a wide variety of precision drilling operations — drilling through or to depth, tapping, countersinking, spot facing.

Batteries of Leland-Gifford Multiple Spindle Drilling Machines provide the extreme sensitivity plus infinite flexibility needed to handle these operations quickly, accurately and profitably. The right tools are always ready for use in the right sequence and combination. Work moves smoothly from one spindle to the next, requiring a minimum of handling even for the most complex pattern of holes.

Walk through the plants of the nation's foremost producers of precision work and you'll find one name more than any other on precision drilling equipment — LELAND-GIFFORD. Leland-Gifford Multiple Spindle Drilling Machines are available in a complete family of sizes in a wide range of swings, number of spindles, types of feed. New bulletins give complete information. Write for them.

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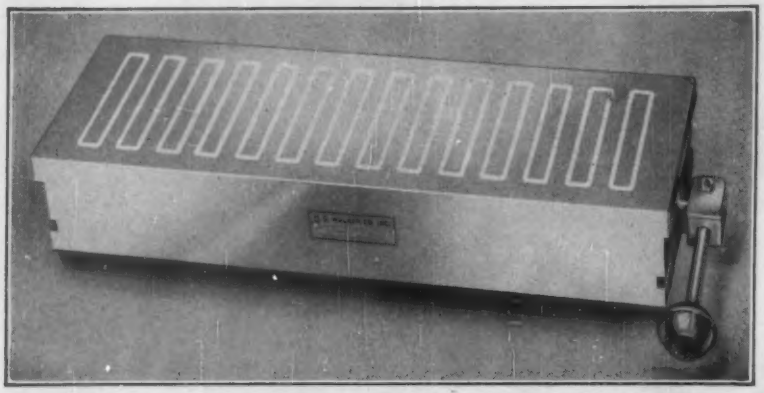
Walker Chucks
You May As Well Have the Best



Pioneer in the making of magnetic chucks, Walker engineers have the know-how to produce chucks that have the proud distinction of being the best in the world.

Walker Permanent Rectangular Chucks are made in nine standard sizes from 4" x 8" to 12" x 24" and larger for special applications.

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Walker engineers, ready to help you with your holding and lifting problems, are always as near as your telephone, Worcester, Massachusetts—PL 6-6293.

of an insert. He then proposed to economize by brazing the used tip to a shank.

As I mentioned (*AM*—Sept 10 '56 p91), this was a step in the right direction because it avoided throwing away valuable carbide. Now I see that my "miserliness" is well justified by a Frank L Brugger, bless him, (*AM*—Dec 17 '56, p153) who says that old carbide bits can be sold for about 8¢ apiece to be made up into hard-facing electrodes.

R C Timmons
Cleveland

Use Standard Sizes

As readers and advertisers in American Machinist, we have always been interested in the editorial comment on new tool development and the policy of your organization in presenting this material to your readers in such a manner as to keep them well abreast of this important field.

The surveys you have conducted, plus our own experience, would attest to this fact.

One point which we feel is of paramount importance in today's high-geared production is the ordering or adoption by industry of standard tooling. In our opinion, no manner of repetition can overemphasize the importance of standard items over specials.

Feeling there was a need for a standard line of square, push-type broaches, we completed a survey of the market, found we were on the right track, and proceeded with our plans. We also surveyed the market as to the sizes we had set up, tolerances, etc, and, after returns were in, made some minor changes. The returns on this survey exceeded 25%, which we felt was an indication of the need for this type of tool in industry.

Forthwith, we went into production on a standard line of square broaches and, later, hexagon broaches. They have met with measured success and we are presently engineering other standard shapes. However, we are constantly receiving inquiries and requests for quotations on special square and hexagon broaches that vary only slightly from our standard—the variation being the distance across corners, pilot size, or length.

It would seem that industry is having a hard time in weaning

itself away from the idea that the words "broach" and "special" are synonymous.

Many people do not understand that, to broach a square hole in one pass by the push-broaching method, it is necessary, because of the progressive action of the broach teeth, to have a certain over-all length of tool to produce a given length of cut. They attempt to use an arbor press or hydraulic press with inadequate throat opening, or height over plate and, when they find this is not possible, want to go into a series of special broaches. This immediately defeats the time- and money-saving qualities of the standard item.

In our opinion, it is quite possible that, if these standards were better known, we could both wean industry away from the "broach—special" idea, and have engineering adapt their designs to use standard tooling. In other words, all we are trying to accomplish is to give the customer a time- and money-saving standard tool and, possibly because we are apparently pioneering this development, we are not sure that industry is taking advantage of it.

We believe you will understand the validity of our point, and, while we are a small company, we are seriously trying to contribute our knowledge to the best advantage of all concerned.

John S duMont, vice president,
The duMont Corp.
Greenfield, Mass

The use of special sizes where a standard size would serve as well is still one of the most conspicuous forms of waste in Metalworking. The approach taken by the duMont Corp, first surveying industry requirements and then adopting a series of standard sizes to meet those requirements, is a sound one. The next step, that of educating industry to use the standard sizes, is a slow one. The best progress can usually be made by working through the appropriate sectional committee of the American Standards Association. In this case, it would be Committee B-5 on small tools and machine tool elements which operates under the sponsorship of ASME. By developing a standard through producer-user cooperation, a certain initial acceptance is guaranteed and the high standing of ASA standards speeds general acceptance.—Ed.

ACCO products

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. . . is the greatest value ever offered in a tracer lathe. Forty years of building fine lathes and 25 years of hydraulic duplicating experience make an unequalled combination. Extreme accuracy of duplication, coupled with enough ruggedness to utilize the full horsepower of the machine, make Rockford Tracer Lathes the preference for repetitive turning in any volume.

The Rockford Tracer Lathe can be converted to a completely standard engine lathe in a matter of minutes, thus adding to its versatility and flexibility for small lot production.

Complete interchangeability of multiple diameter work can be achieved by unskilled operators at production speeds comparable to turret lathes. These machines are rugged enough for heavy production work, yet flexible enough for tool room or job shop production.

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PLUS FEATURES

Duplicating attachment designed and built by the lathe manufacturer specifically for Rockford Lathes. No divided responsibility.

Kopy-Kat Valve features proven accuracy, precision manufacture, built-in retract.

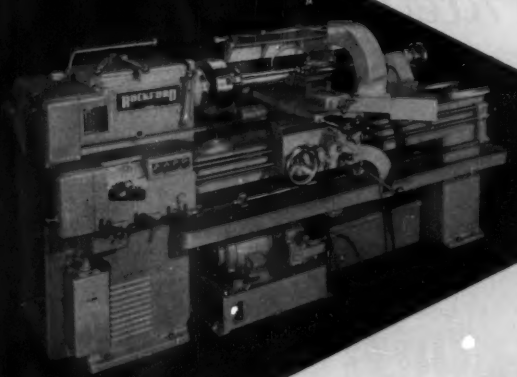
Power unit requires no additional floor space - includes sealed unit, compensating pump and filter.

Electrical controls are combined and interlocked with machine controls from centrally located push button station.

European tool post.

All hydraulic lines are clear of chips and coolant - out of the operator's way.

Automatic feed cut-out - a standard feature on Rockford Tracer lathes.



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ECONOMY PRICED

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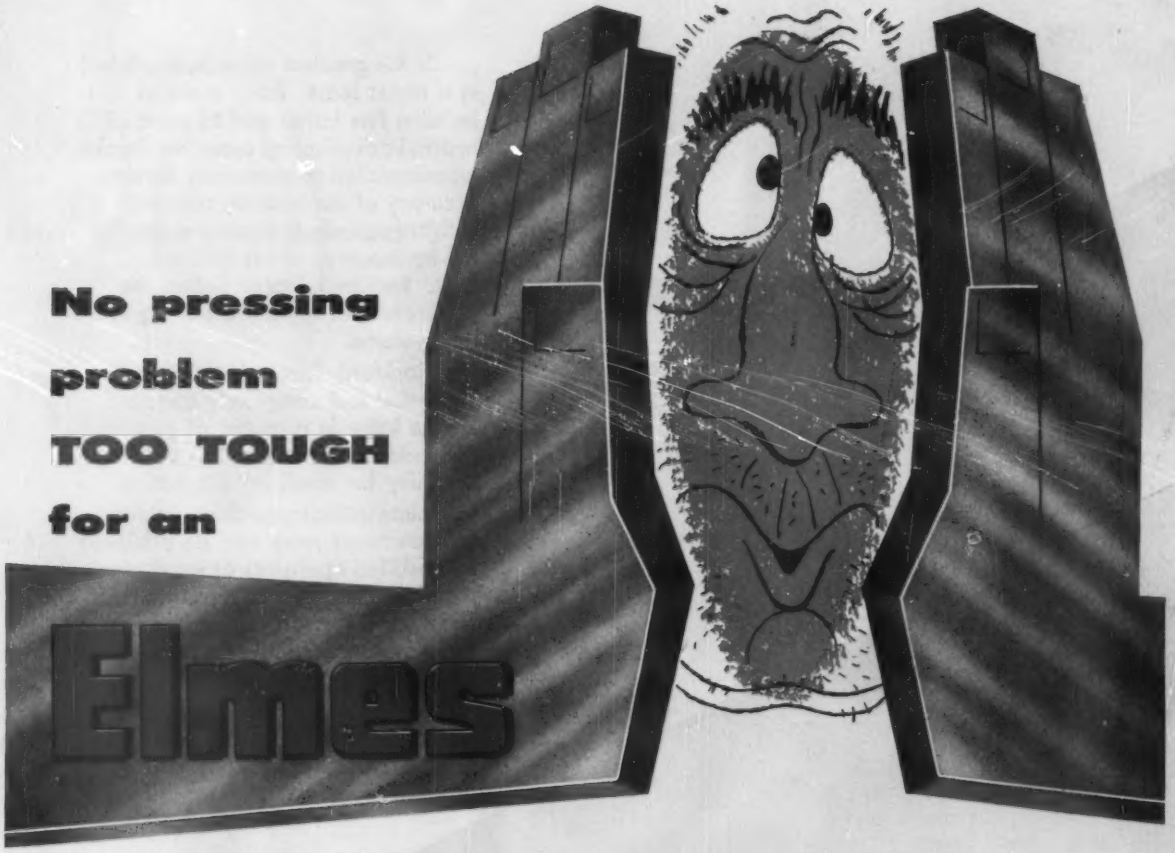
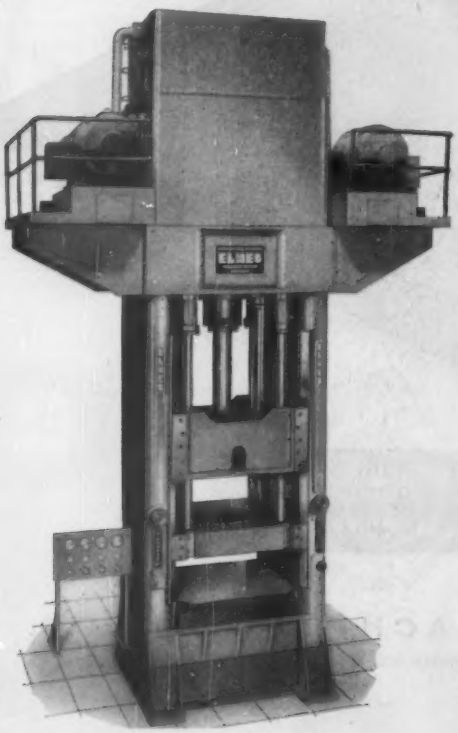
2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS



"Job-Fitted" HYDRAULIC PRESS



Those tough production problems that require something extra in drawing, forming, bending, hobbing, forging or other press performance are just the kind that Elmes engineers like to be called in on. More than 60 years in the specialized field of hydraulics has built the Elmes reputation for recommending and supplying hydraulic presses that are "job-fitted" for profit-making performance, no matter how special the job.

While a wide range of standard Elmes Press designs meet all usual requirements in drawing, forming and other press work, the development of special presses "job-fitted" to the customer's exact requirements is a major part of Elmes engineering service. Whatever your pressing problem, it will pay you to call in Elmes for consultation and recommendations. Distributors in principal cities.

American Steel Foundries

Elmes ENGINEERING DIVISION

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METAL-WORKING PRESSES • PLASTICS MOLDING PRESSES • PUMPS • ACCUMULATORS

NEWS REPORT

Spot news...

- **First detailed report on a Russian "automatic factory"**—the almost legendary Moscow ball and roller bearing plant—appears for the first time anywhere (and that includes Soviet technical publications, too) on p147 of this issue. Rough metal tube material goes in one end and finished bearing assemblies, all wrapped and packaged, come out the other—yet not a single human operator is employed from start to finish.

- **Newest entry into the ceramic magnet field** is "Indox V," produced by Indiana Steel Products Co, Valparaiso. Cheaper, lighter and said to be 3½ times as strong as metallic magnets, it is made from inexpensive, non-critical materials, is recommended for use in devices where size is a factor. Still another new magnet development, GE's "iron dust," is described on p156.

- **Japanese heavy industry is going into automation in a big way.** One large firm has ordered in-line machines such as those used by Delco-Remy and other U S automakers, has offered to buy a straight-line machine for multiple operations to assemble spark plugs (such as they noticed in AM p122 Oct 8/56 issue).

- **A 6-mile-long conveyor system for auto assembly-metalfinishing** will be installed by France's SIMCA. Some 60-70 dual-duty electronic conveyors have been ordered from England's Geo King Ltd—for selecting car bodies from the assembly shop and moving them through the entire metalfinishing process. System will insure that cars are colored in correct sequence, too.

- **More on-the-job injuries occur between 10 and 11 am than any other hour,** a California state survey shows. Work injuries rise steadily each hour from 6 am to the 10-11 am peak, fall off, then build to an afternoon peak at 3 to 4 pm.

- **Britain claims it has the best gas turbine auto yet**—the Rover T3—now on the test bench. Claims: turbine takes up less room, gets more miles to the gallon, heat exchange is more efficient. One reason: turbine disks are machined from precision forgings rather than from solid metal.

- **An employee isn't responsible for an inspection he feels he can't perform,** the California Unemployment Insurance Appeals Board has ruled. The case: an aircraft mechanic ordered to examine an airplane autopilot said he couldn't do it, but did so. He refused to sign the register that the autopilot had been inspected, was discharged. The Board ruled "no misconduct."

- **Russians are using brazed ceramic tool tips** (copper brazed after vacuum metallizing, using a flux containing titanium) to take 0.2 to 0.4-in. cuts on 0.45C steel. Spindle speed: 1200 rpm. Tool feed: 0.014 in. per revolution.

- **Air springs for automobiles will shortly go into volume production** at Firestone Tire & Rubber Co's new plant at Noblesville, Ind. Tradename: "Airide."

Spot index to major News stories...

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Up to twice as much production per .001" of wear!

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FOR PRECISION

TEST REPORT SHOWS THERE IS A DIFFERENCE IN BUSHINGS

Ex-Cell-O Bushings out-perform competition.

An automotive manufacturer proved this conclusively by putting Ex-Cell-O Bushings up against two other leading brands in a practical, on-the-job test. Result: Ex-Cell-O out-produced brand A by 1210 pieces, brand B by 345 pieces! Average number of parts produced during .001" wear:

Brand A	1,045 pieces
Brand B	1,910 pieces
Ex-Cell-O	2,255 pieces

An important reason for this outstanding performance is that Ex-Cell-O uses high chrome and high carbon oil-hardening steel, heat treated in Ex-Cell-O's automatic atmosphere-controlled equipment to uniform 62-64 Rockwell "C." These bushings are precision ground inside and out and under the head for perfect seating. Try Ex-Cell-O Bushings and see for yourself.

For "same day" shipment write or wire Ex-Cell-O in Detroit or call your Ex-Cell-O Representative. Catalog available on request.

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DETROIT 32, MICHIGAN

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56-57

Washington ... NEWS REPORT

Legislative outlook . . .

Don't look for Congress to act on much major legislation during the new session. It will be a slow-starting, organizing session. Tax action, when it comes, is likely to be limited to (1) extension of the 52% corporate rate and war-time excises on autos, gas, and the like for another year, and (2) a revision bill making technical corrections in the 1954 revision law and closing some "loopholes."

In the antitrust field, there'll be another try for a pre-merger notification bill. The administration's labor legislative program will be mainly a repeat of two years ago: extension of minimum wage coverage to retail and service employees; federal aid to depressed areas; federal control over welfare and pension funds; minor Taft-Hartley Law changes—principally, one to allow economic strikers to vote in NLRB elections.

Another Senate investigation of the administration's military policy may be in the works. The Symington Subcommittee's report on last year's stormy airpower probe will be out shortly, is expected to criticize the administration for not pushing ballistic missile and strategic bomber programs faster. Soon after the report is out, the Senate Armed Services Committee will have top military brass outline the latest defense strategy in secret session. At that time, the committee will decide whether to let Symington take off again with his investigation.

The Committee is troubled by: (1) the administration's failure so far to use the $900 million tagged on to last year's appropriation for a speedup in B-52 production and missile research; (2) Wilson's plan to cut the Air Force's 137-wing goal by reducing tactical air strength.

Business outlook . . .

Government experts predict "continued good production and sales rates" for most major industries in the new year. This is how the Commerce Dept's Business & Defense Services Administration sees the outlook for key industries:

• **Machine tools**—shipments of cutting type tools are expected to rise to $410 million in the first six months of 1957, compared to $394.4 million in the same period last year. Forming and shaping tool shipments will total $145 million, up $2 million over last year. But new orders are expected to hit $105 million, down $26 million from first half 1956.

• **Steel**—booming steel needs of machinery, construction, shipbuilding, oil & gas, and freight car building industries should keep steel producers at capacity output in first half 1957—indeed, a new record high in production seems likely. Supplies of plate, structural shapes and some types of tubular products will stay tight. Demand for sheet from auto and other consumer goods makers will be heavier than in closing months of 1956.

• **Copper**—supplies will be adequate. Demand will be strong in early 1957, then taper off as new housing starts decline. Copper wire output will be up slightly; brass mill and brass and bronze foundry production will be down.

• **Aluminum**—shipments of mill products and ingots will reach new record levels during January-June, probably 8% above last year. But supplies will be plentiful due to production from new capacity.

• **Consumer durables**—in general the outlook is "encouraging," though "spotty" in industries like jewelry and silverware. Record sales are expected for washers, dryers, and ironers. Sales of toys, fountain pens and mechanical pencils will go up.

• **Autos and trucks**—output of 6.5-million cars is forecast, 650,000 over 1956. Truck production in the first six months will be 3% below last year, truck-trailer output 5% under 1956. Production of automotive replacement parts will exceed last year's volume by about 7%.

• **Machinery**—farm equipment will show a "modest increase" in January-June. Construction machinery production will equal last year's $2-billion level—assuming enough steel plate and structural shapes and nickel. Output of mining machinery will rise slightly. Oil field equipment sales will go up about 15%.

• **Aircraft**—industry has $19-billion backlog—one-third more than last year.

• **Shipbuilding**—slight increase expected in new awards for ocean-going vessels. Inland waterways vessels will remain at current high level of production. Shipbuilding will still be slowed down by steel shortages.

• **Railroad freight cars**—production of 6000 cars a month should be maintained, providing steel supplies are adequate.

• **Electrical and power equipment**—new orders for power generating equipment will equal last year's record volume. A boost of at least 12% is expected in power transmission and distribution gear.

• **Electronics**—production will remain at the same level as 1956, $6.1 billion.

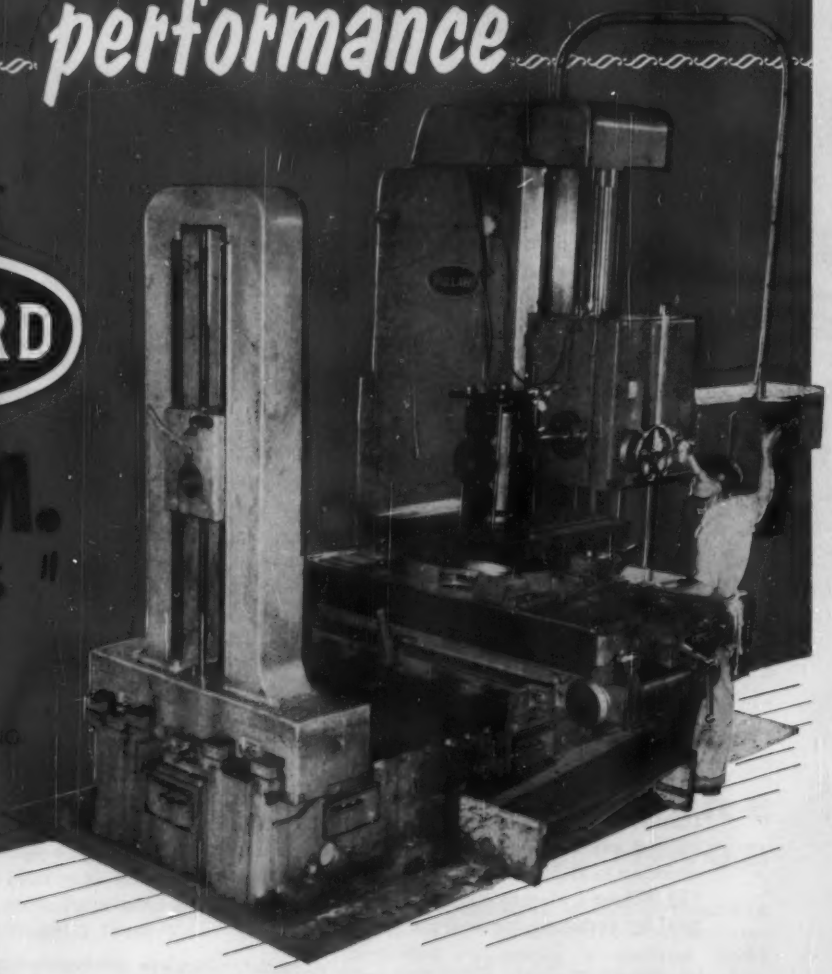
"we're getting TOP performance

from our

BULLARD

H.B.M.

Model 75



"The acquisition of our Bullard HBM, Model 75 has eliminated a production bottleneck by giving us a reliable machine to handle our output" says Mr. Frank A. Kocevar, Chief Industrial Engineer at The Joy Manufacturing Co., of Michigan City, Indiana, manufacturers of portable and stationary compressors for industry.

This "built-in reliability" of the Bullard HBM, Model 75 can be applied to your boring, milling, drilling and facing problems — check its outstanding features by calling your nearest Bullard Sales Office or Distributor or for a complete catalog, write to —

THE BULLARD COMPANY
BRIDGEPORT 9, CONNECTICUT

Detroit ...

A look at labor . . .

Fewer workers were involved in strikes in 1956 than in all but one of the last 10 years, according to the U S Labor Dept.

Thus you can look for the honeymoon to be over between the automakers and the autoworkers this year, even though the industry is covered by contracts that run until 1958. There will be a constantly increasing pattern of strikes, all small and irritating, to soften automakers for 1958.

Back in 1955, the big issue was a form of guaranteed annual wage—a revolutionary move—and the UAW won what might be called a victory, even though it won increased benefits rather than an actual guaranteed annual wage. But marring the victory was the discontent of the skilled trades workers of UAW.

Impatient with fringe benefits and fearing the steadily narrowing margin of actual wages between production workers and themselves, the skilled workers almost upset UAW's 1955 gains. The skilled workers, who hadn't been particularly harassed by the unemployment bogey since before the war, plugged hard to get the wage gap between skill and production restored to its "normal" 50%.

Then in 1956, the craftsmen showed their teeth to UAW, creating an abortive splinter group in Flint, Mich, known as the "Society of Skilled Trades." The movement started with a rush and within weeks had extended through the major industrial counties of Detroit's auto manufacturing areas. Doomed to extinction under the bludgeonings of "dual unionism" by UAW International, the Society of Skilled Trades nevertheless made its point with the International's top brass.

UAW has taken the hint—and although it is a prime medium for the production worker rather than the skilled worker—beginning this year UAW will grant its skilled people proportionate major benefits they have never before enjoyed.

First important effect: Current spread pay rates in the tool and die, maintenance and related skilled trades will be eliminated. And to bring about a broader differential between skill and semi-skill, UAW will take as its starting point in all future wage talks the skilled workers' maximum rate plus a substantial wage boost. In other words, the pay rates of production workers naturally will not be dropped to increase the differential—the wage demands of craftsmen will be on a higher plateau.

Not only that, UAW plans to negotiate a supplemental agreement, for the benefit of the skilled worker alone, within its master agreement. And the skilled worker will have the right to ratify or to turn down his own agreement.

What can all this mean?

Trouble for both industry and the unions, for one thing. The union will have trouble initiating these demands, but once it does, its chances of getting what it wants out of industry are doubled. UAW will have two strike weapons instead of one—benefits it wins for the production worker it can get for the skilled worker the next time around, on grounds of precedence.

Management's bargaining strength will be considerably weakened. The union now has a double-barreled shotgun instead of the rifle it used before. If the unions can talk the manufacturers into granting two separate contracts, the manufacturer will be caught in a squeeze between the production worker and the skilled worker. Even though one group accepts a contract, the plant can be struck by the other. Then, after the second group is satisfied, the first can refuse to ratify and strike the plant—ad infinitum.

But it's not all gravy for the union, either—once the skilled people have their own supplemental agreement; their own voting power within the union, their own representatives, a bigger apprenticeship program, the right to ask UAW International directly for strike approval—how do you keep the craftsman down on the farm of local unionism? How do you keep him from branching off and weakening the bargaining power of the parent local?

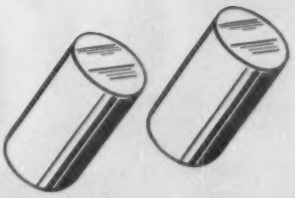
The unions frankly don't know. They only hope that the whole framework will hang together as long as the membership is happy.

The whole new plan of supplemental agreements —representation of skilled workers, a broader apprenticeship program, and so forth—is in effect a bargaining point that must be thrashed out between unions and management.

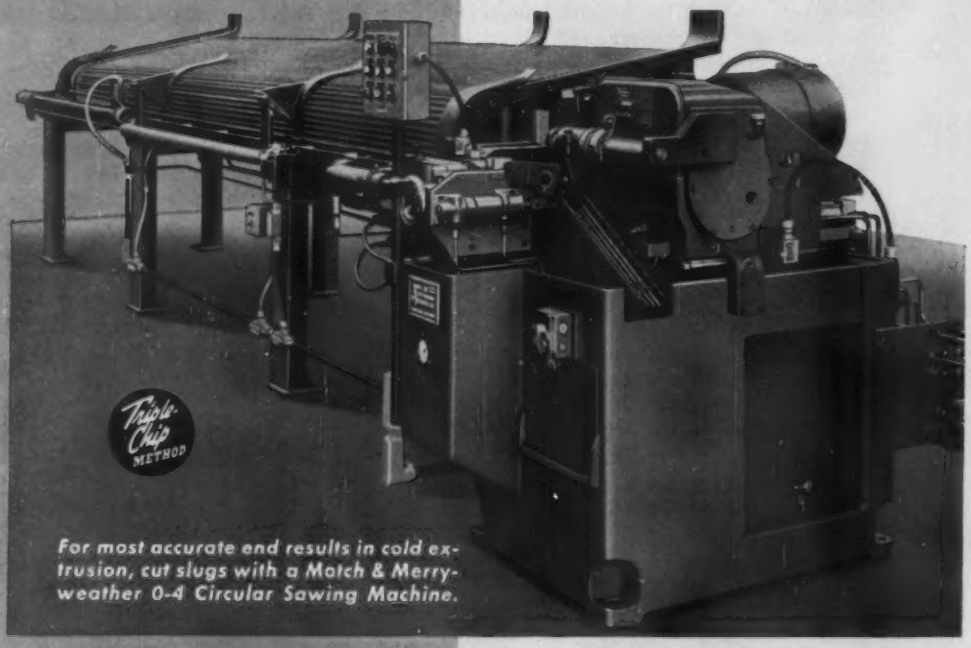
Bargaining for the skilled trades can be expected to be bitter, difficult, long-winded. And because it is essential to the master contracts to get this initial bargaining out of the way, you can look for a series of short, harsh, nasty strikes in the latter half of this year—they'll be designed solely as a show of strength.

The hard fact behind it is that the ratio of skilled workers to unskilled and semi-skilled is rising, maybe automation is the cause, and these almost unheard of moves by UAW are aimed straight at keeping the people happy who may one day soon become its dominant factor.

cold cuts

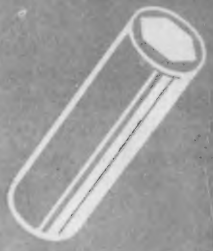


BY MOTCH & MERRYWEATHER



For most accurate end results in cold extrusion, cut slugs with a Motch & Merryweather 0-4 Circular Sawing Machine.

. . . make better COLD EXTRUDED PARTS



The Motch & Merryweather No. 0-4 Precision Circular Sawing Machine is automatic from the storage table to the finished cut slug. It cuts slugs accurate to ±.002" with uniformly square ends and minimum burr. Give your cold extrusion press the opportunity of producing more work than ever before, with more accuracy than ever before, at a lower cost per piece than ever before.

THE MOTCH & MERRYWEATHER MACHINERY CO.

MACHINERY MANUFACTURING DIVISION
CLEVELAND 13, OHIO

Builders of Automatic Precision Cut-Off, Milling and Special Machinery

Machine tools ... NEWS REPORT

Europeans bid for business . . .

Foreign builders are doing their best to get a chunk of whatever machine tool business develops in the US armed services.

Some 50 or more surface grinders for maintenance work in the Air Force were recently put out for bids. A German builder quoted on them and tried hard for the order. The German bid eventually was rejected because it did not meet the specifications. Award finally was made to a midwest builder.

About 45 3-ft radial drills are now about to be purchased by the Air Force on a negotiated-contract basis. These radials are for maintenance work too. Foreign builders are said to be making a vigorous play for this business.

It was not so long ago that the Air Force's award of a large group of radials to a British company caused quite a stir in Washington circles and in the machine tool industry.

The first of the British radials is reported about to be delivered. The Air Force is said to have postponed any action on the pending 45-radial deal until it sees how the British radials perform.

One prediction can be made for sure: If the current business goes to a foreign builder, a loud protest will be made by domestic machine tool builders.

Some influential armed services people, incidentally, are strongly opposed to the military forces making machine tool purchases in Europe.

China de-emphasizes heavy goods . . .

China is reported to have cancelled orders for $300 million of complete factory units for machine building from Russia, East Germany, Poland and Czechoslovakia. This means that production targets are being cut back in the second Five-Year Plan (1958-1962).

Greater emphasis is to be put on light industry, combined with higher wages and improved conditions for the peasants. Heavy industry, for the time, is to be played down.

Wage rates go up . . .

A clue to what has happened to wages of workers in European machine building industry has just come out of Switzerland. From 1950 to 1955, the wage rate rose 17%. In the same period, the general price level rose half as much.

Wages in the West German machine industry went up 38%, with only one-quarter of the advantage lost to workers by advances in living costs.

In Britain, wages in the 1950-1955 period increased 47%, with the cost of living rising two-thirds as much.

European Show Next September . . .

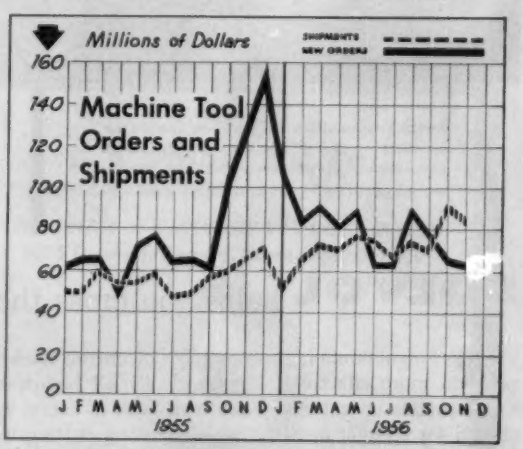
The fifth European Machine Tool Exhibition will be held in Hanover, Germany, September 15 to 24, 1957. The show will be managed by a general commissariat organized by the Association of German Machine Tool Manufacturers (VDW). Hermann Heller of Gebr Heller GmbH has been appointed commissioner-general.

Only US machine tools to be shown at Hanover will be those built in the plants of European affiliates of American companies who belong to European builders' associations.

US builders otherwise will not be allotted any show space. This is a departure in policy from previous European shows, at which US builders had space.

Still another US machine tool builder, whose identity cannot be revealed, has chosen to organize a British subsidiary. It plans to have its standard machines made in England on contract by a company near London that up to now has not manufactured machine tools.

The US company will continue to build and sell its special machines abroad from its US factory.



FOR THE FOURTH MONTH IN A ROW, machine tool new orders in November dropped—from October's $66.1 million to $63.75 million. Shipments, too, declined in November to $81.3 million from October's 1956 high of $89.75 million

Stuart SOLVOL

LIQUID CUTTING COMPOUND

Lubricates as it Cools

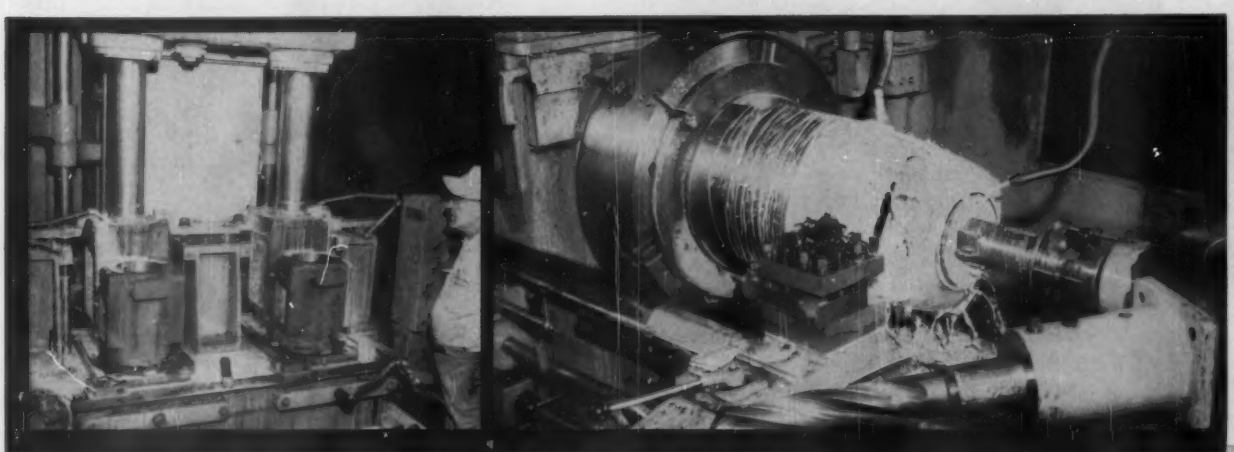
Keeps Gardner-Denver Company's difficult production jobs "right at peak"

"Solvol prolongs cutting-tool life . . . increases production . . . reduces costs . . . and keeps production right at peak," —that's the report from Gardner-Denver Company, Quincy, Illinois, where Stuart's Solvol is used as a multi-purpose cutting oil to produce profit-boosting benefits ordinary "coolants" can't give.

Solvol's excellent combination of lubricating and cooling qualities has stepped up performance on 30 different machines used for milling, drilling, turning, and boring in this manufacturer's main plant at Quincy, Illinois. The four jobs illustrated are typical of the way Gardner-Denver engineers maintain machine and cutting-tool efficiency, producing parts for compressors, pumps, rock drills, and other heavy equipment.

They are typical, also, of the way Stuart's Solvol is used in profitable plants everywhere for high-speed turning, vertical surface broaching, round hole broaching, and similar heavy-duty jobs on which water-mix cutting oils are indicated.

For Solvol *lubricates as it cools*, keeps tool wear down by providing a tough protective film of oil at the cutting edge . . . allowing chips to slide freely up the face of the tool . . . minimizing heat caused by friction on heavy cuts taken at high speeds.

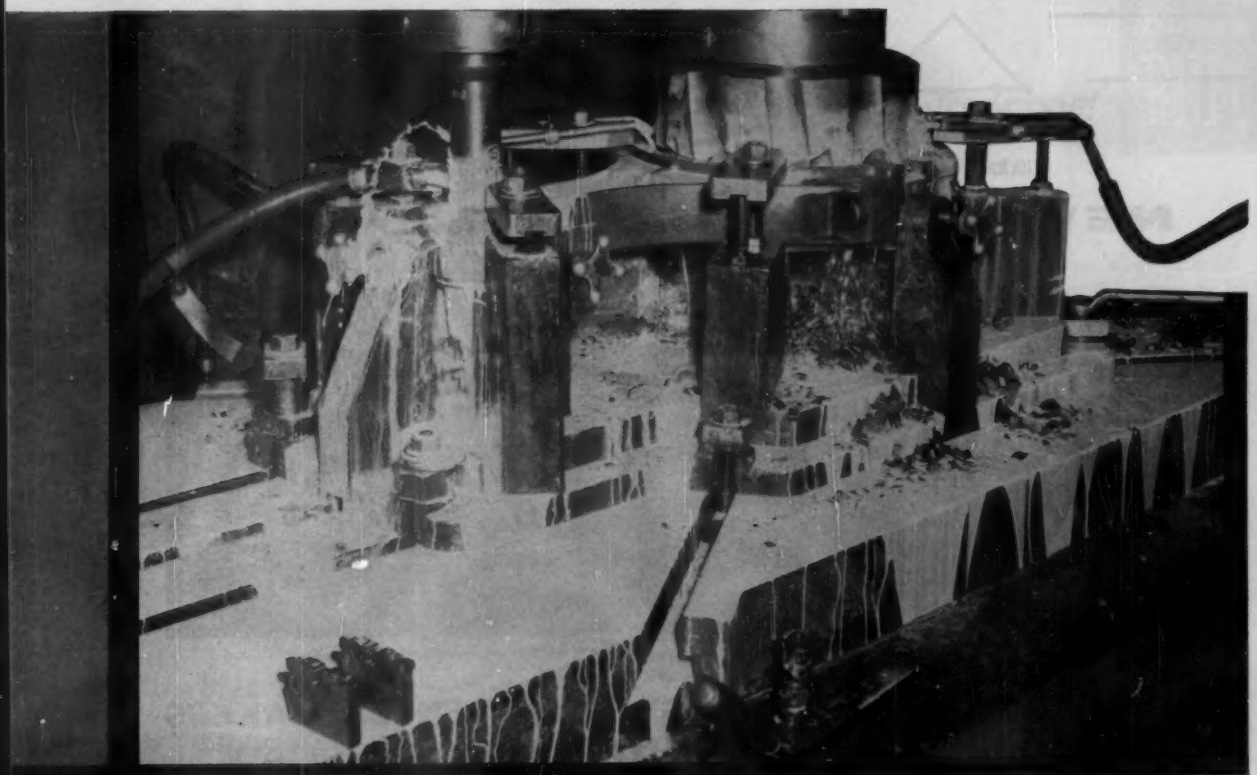


Boring operation on cast-iron compressor cylinders removes .019 in. stock. Feed is 3.5 in. per minute . . . production time, 7.69 minutes per piece. Solvol eliminates "edge build-up."

Prolongs tool life on this high-speed turning operation. Up to ¼ in. of stock is removed from these cast steel cylinder cross-heads at speeds of 300 sfpm. Standard 30-to-1 Solvol and water absorbs heat rapidly and reduces friction for good utilization of power without excessive tool wear.

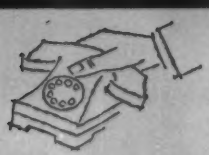
SOLVOL helps you cross the heat barrier in metal-cutting

Stuart's Solvol liquid cutting compound controls the heat problem more effectively on practically all high-speed metal-cutting operations. Each ingredient of Solvol was chosen for specific qualities which prolong cutting-tool life . . . protect machines . . . maintain high standards of accuracy and finish . . . and assure greatest on-the-job economy. Solvol has high detergency plus superior emulsifying and rust-inhibiting qualities. Heavy-duty pure fatty oil increases surface wetting characteristics and boosts the lubricating factor of the petroleum base. Experience-proved emulsifiers increase stability and prolong Solvol's effectiveness. Standard starting mixture is one part Solvol to 30 parts water . . . other mixtures are used to meet unusual requirements. Your Stuart sales engineer will be glad to give you specific recommendations that reduce your operating costs and step up performance.



Tough milling job upgraded by Solvol's lubricating, cooling, and anti-rust qualities, machining two bores in heavy cast steel connecting rods (above). No chip "weld" on cutting edges . . . *lubricating and rust-inhibiting* qualities protect machine and fixtures. Pregrind operation removes up to .010 in. stock from each bore. One rod finished to within ± .002 in. every 33 minutes.

Carbide-tipped face mill takes heavy cut on this large slush pump connecting rod. Solvol withstands high unit pressures . . . provides a *tough film of lubrication* to reduce friction and prevent excessive heat build-up.



Phone your
Stuart Service Center

Arrange now to test Stuart's Solvol on your difficult metal-cutting jobs.

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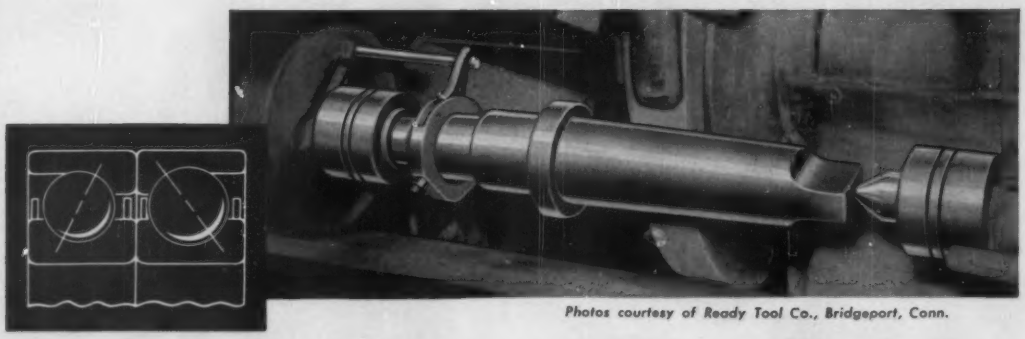
METALWORKING LUBRICANTS

FACTS

about

NEW DEPARTURE BALL BEARINGS



Photos courtesy of Ready Tool Co., Bridgeport, Conn.

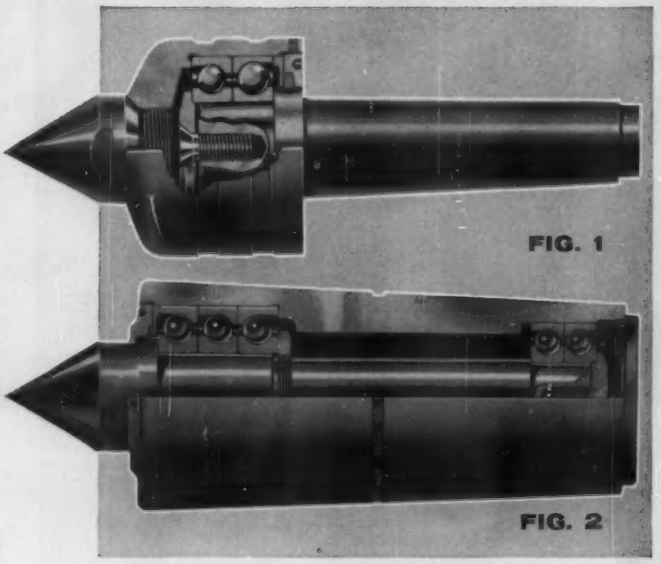
PRELOADED BALL BEARINGS HELP CENTER MAKERS GUARANTEE ACCURACY TO WITHIN .000050"!

Accuracy . . . *to within less than .000050" total indicator run-out!* That's the performance live centers designed around New Departure preloaded ball bearings deliver!

Such super accuracy of work stems from *extreme rigidity* . . . the unsurpassed ability of these preloaded duplex ball bearings to handle combination loads with minimum deflection.

In live center applications, New Departure ball bearings with medium and high contact angles are mounted duplex and positively clamped together to assure the correct predetermined preload condition. As work expansion increases the thrust load, radial centering becomes more rigid and accuracy is precisely maintained.

New Departure ball bearings for live center applications are made to ultra-precision tolerances. Smooth operation with low frictional loss is assured, as well as continuity of accuracy throughout long life. Write for further details.



(Fig. 1) Tapered-shank, spindle-type center in which New Departure ABEC 7 specification duplex ball bearings support grinding loads with undiminished accuracy throughout long use.

(Fig. 2) Enclosed spindle designed around five New Departure ultra-precision preloaded duplex ball bearings.

SEE "WIDE WIDE WORLD" SUNDAYS—NBC-TV

BALL BEARINGS MAKE GOOD PRODUCTS BETTER

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN.

What's ahead ... in Metalworking

NEWS REPORT

Operations close to wartime peak...

There is good reason to believe that metalworking production, now far above any previous peacetime level, will stay close to its current volume for the next few months. It may even rise a bit.

AMERICAN MACHINIST **Index has inched up steadily** in recent months to its present peg of 181 (with 1947-1949 as 100). It now is within 18 points of the wartime peak attained in November, 1943.

Nothing has happened recently to change the forecast that this year will surpass the 1956 total, when Metalworking produced $119 billion of goods.

Biggest year for steel . . .

Steel is heading into the biggest year in its history. The industry now has a larger capacity (132 million ingot tons) than a year ago, and probably will turn out 120 million tons in '57. Users are likely to do some inventory-building the first half of the year.

Autos, farm machinery, pipelines, freight cars, industrial machinery and shipbuilding will take more steel than in '56.

Nonferrous metal production is likely to go up modestly, with some additional stockpiling contributing to overall demand. Brass mills, however, complain that first-quarter business won't be more than 70% of capacity at best. Customers are holding to a close-to-the-vest buying policy. Aluminum manufacture is at an all-time high.

Federal and private spending on new aircraft and missile programs will be up this year. It is a good guess that the aircraft and parts industry will do 15% more business than last year. And 1956 was about 15% ahead of 1955.

Farm implement output and sales, which took a sharp tumble the past year, show signs of rising around 10% this year. Dealers' stocks have been pared down to a level in keeping with current sales. The farm income in '57 is almost sure to be up at least 5%.

Construction machinery demand should push up 10% above the 1956 volume, which in turn was 20% better than the 1955 total. Earthmoving equipment demand should be especially good, benefiting from the highway program.

Freight car builders go into the new year with a pileup of more than 55,000 units on order. Railroad (captive) shops have an even larger backlog. Though steel supply will be a problem, freight car building is expected to average 6500 units a month, compared with 5000 the past year.

Office machinery output rising . . .

New orders for office machinery are 20% bigger than a year ago. The coming year will be the best on record, showing a sizable increase over 1956.

A gain of 25% or more is forecast in shipments of instruments and controls this year. This industry is one of the nation's fastest-growing sectors.

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	DEC. Estimated	NOV. Preliminary	OCT. Revised	NOV. Year Ago
Total Index	**181**	**180**	**177**	**172**
Machinery	**154**	**156**		**143**
Electrical Machinery	**218**	**218**		**198**
Autos	**149**	**113**		**176**
Other Transportation	**325**	**355**		**275**
Other Metalworking	**147**	**150**		**143**

NEWS REPORT What's ahead . . . in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	DEC. Estimated	NOV. Preliminary	OCT. Revised	NOV. Year Ago
Total Index	**152.0**	**151.0**	**149.1**	**140.9**
Metalworking Machinery	174.1	172.4	158.1	
Other Machinery exc. Electrical	158.3	157.3	147.4	
Electrical Machinery	149.6	149.1	136.8	
Fabricated Metal Products	144.2	141.4	135.9	

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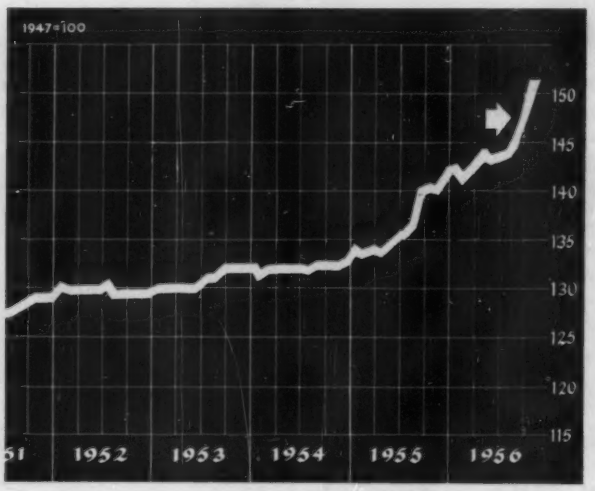


Business outside Metalworking to be higher . . .

Prospects for business outside the metalworking field look very good for 1957. Here is a brief rundown:

Petroleum refiners expect production to be 5% above the 1956 figure, thanks to the Suez situation. Demand for industrial fuels will be high, with U S output running 3% better than in the past year.

A new peak will be reached in paper production. A gain of about 3% over the 1956 record-breaking total is anticipated.

Rubber will have a good year, as automobile sales rise. Replacement tire market is growing, thanks to an ever-growing number of cars on the road.

Output of processed foods and beverages will go up the coming year, just as it did in 1956. Reasons: increased population, more disposable income per capita, and a trend toward more processing of foods.

Textiles, having suffered a decline in production of about 3% the past year, will register some improvement the next 12 months. Demand will be stronger from both industrial users and consumers. The only area in which textile sales held up in 1956 was in wearing apparel.

Apparel production promises to continue at about the same level in 1957 as in 1956. It might rise a little, in line with population growth. The volume of sales the past year was approximately the same as in 1955.

Lumber people are prepared for a small drop in business. Two factors are responsible. One is the rise of competitive materials such as brick and plastics, and the other is the prospective decline in housing starts.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49=100)*	154.8	155.7	147.7
Steel ingot production (thousand tons)	2,370	2,525	2,309
Electric power output (million Kilowatt hours)	11,196	12,225	10,751
Production of automobiles and trucks	188,439	195,168	122,118
Engineering construction awards (Eng. News-Record, millions)	$282.3	$456.6	$251.8

QUARTERLY BUSINESS INDICATORS

	Latest Quarter	Preceding Quarter	Year Ago
Gross National Product (billions)	$413.8	$408.3	$396.8
Expenditures of new plant and equipment (millions)	$ 35.87	$ 34.49	$29.65
Profits after taxes in primary iron and steel industry (millions)	$397	$376	$345
Profits after taxes electrical machinery industry (millions)	$193	$163	$173
Profits after taxes in motor vehicles and parts industry (millions)	$315	$400	$578
Profits after taxes machinery (except electrical) (millions)	$392	$321	$298
Motors and generators new orders index (1947-1949=100)	253.0	224.0	185.8

* Seasonally adjusted

BURGMASTER®

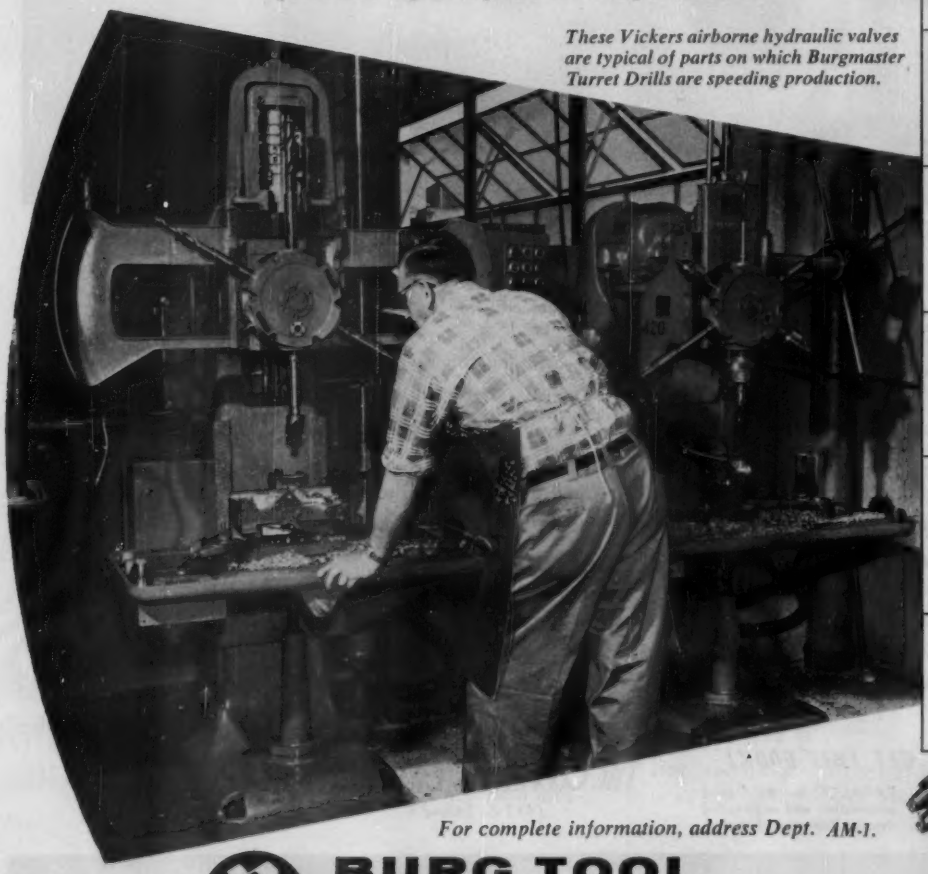
POWER INDEXING

Turret Drills

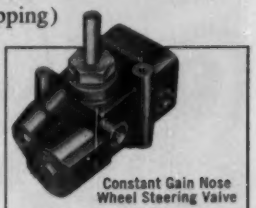
step up AN porting operation 25% at Vickers, Incorporated

Vickers, Inc., Div. of Sperry Rand Corp., El Segundo, Calif., manufacturers of hydraulic equipment, use both hand-operated and automatic hydraulic Burgmaster Turret Drills in their production lines. The company states that the AN porting operation on hydraulic valves has been stepped up approximately 25% over the old single spindle method. Vickers have found that the Burgmasters maintain sizes accurately, are easily set up, and perform multiple operations (drilling, reaming, counterboring, tapping) in one set-up, with one operator—automatically.

Automatic hydraulic Burgmasters (6 and 8 spindle models) feature skip indexing, automatic cycling and infinitely variable preselective feeds. All models (including the 6 spindle manuals) provide power indexing, pre-selective spindle speeds and very close pre-selective depth control.



These Vickers airborne hydraulic valves are typical of parts on which Burgmaster Turret Drills are speeding production.



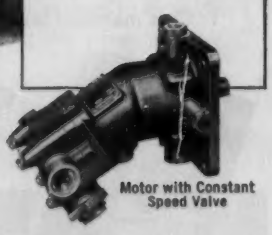
Constant Gain Nose Wheel Steering Valve

Hydraulic Motor with Anti-Overrun Flow Control

Flow-Sensitive Pressure Regulator

Relief Valve with Thermal Protection

Power Control Flow Regulator



Motor with Constant Speed Valve

For complete information, address Dept. AM-1.

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U. S. Steel Supply Provides Customers with **SMOOTH ACCURATE SHEARING**

One Shear Takes the Place of Two or Three

No. 12E-12 Steelweld Shear at U. S. Steel Supply, Seattle, Washington, rated for steel plate 12′ x ¾″. Being cut in photo is a plate, size 7′ x 30′ x ¾″. With hand crank on right end, this machine can be adjusted in a few seconds to have exactly the right knife clearance to obtain the finest cut for any thickness. To make this adjustment on guillotine-type shears usually requires several hours.

MANY steel warehouses have two and often three shears, one of a ¼″ capacity for lighter thicknesses, another of ½″ capacity for cutting ¼″ to ½″ material, and a third with 1″ capacity for thicknesses over ½″ and up to 1″. At some of its warehouses, U. S. Steel Supply uses only one machine for cutting the various thicknesses—a Steelweld Pivoted-Blade Shear.

One machine takes the place of two or three, because it is so easy to adjust the knife clearance required to obtain the best cuts for different thicknesses, which can range from lightest gauge metal to the heaviest plate within the capacity of the shear.

Thus, the investment in shearing equipment is kept low, yet the customers of U. S. Steel Supply are always assured of straight, smooth, accurately cut metal on every order.

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STEELWELD PIVOTED BLADE **SHEARS**

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

How Laggard Are You?

"Regularized replacement" is a term about which you are going to hear more and more.

What it means is simply this: A policy of replacing old equipment with new, either on a continuous or periodic basis. It is the antithesis of the helter-skelter, haphazard policy pursued for so long by so many metalworking companies.

The fact is that "regularized replacement" is more than an academic term. It is a policy that is being widely adopted by alert managements concerned with keeping costs down and efficiency up.

For proof, see . . .

the latest survey of 296 capital goods companies made by the Machinery and Allied Products Institute (see p155). It shows solid progress in the direction of scientific appraisal of the replacement needs for production equipment, and recovery by speedier writeoffs of the dollar investments.

Almost four out of five companies surveyed review regularly the condition of their machinery to decide whether replacement equipment should be bought. That represents a big gain over 1948, when only about one out of three companies reported such a program.

More than half of the companies go so far as to employ a staff man with the responsibility for continuous study of the pros and cons of replacement. It is his job to figure out whether an old machine should be retained or discarded.

Six out of ten companies . . .

have an annual capital budget. And one out of four makes up a preliminary capital budget for longer than one year ahead. An overwhelming majority forecast depreciation, sales, earnings, and cash and working capital.

Perhaps the greatest roadblock to replacement of old machines with new has been the requirement of many users that the new units pay for themselves within a very short time, such as three years or less. The MAPI survey shows that this rule-of-thumb measure is either being relaxed, by lengthening the payoff period, or being abandoned in favor of practical formulas. Almost one out of five companies reported use of the MAPI formula.

Not only are the managements of capital goods producers being converted rapidly to the highly commendable practice of studying on a continuing basis the replacement of old equipment and appropriating year by year the necessary funds to make the desired replacements. They also are taking advantage of the new tax laws to depreciate the new equipment as fast as possible.

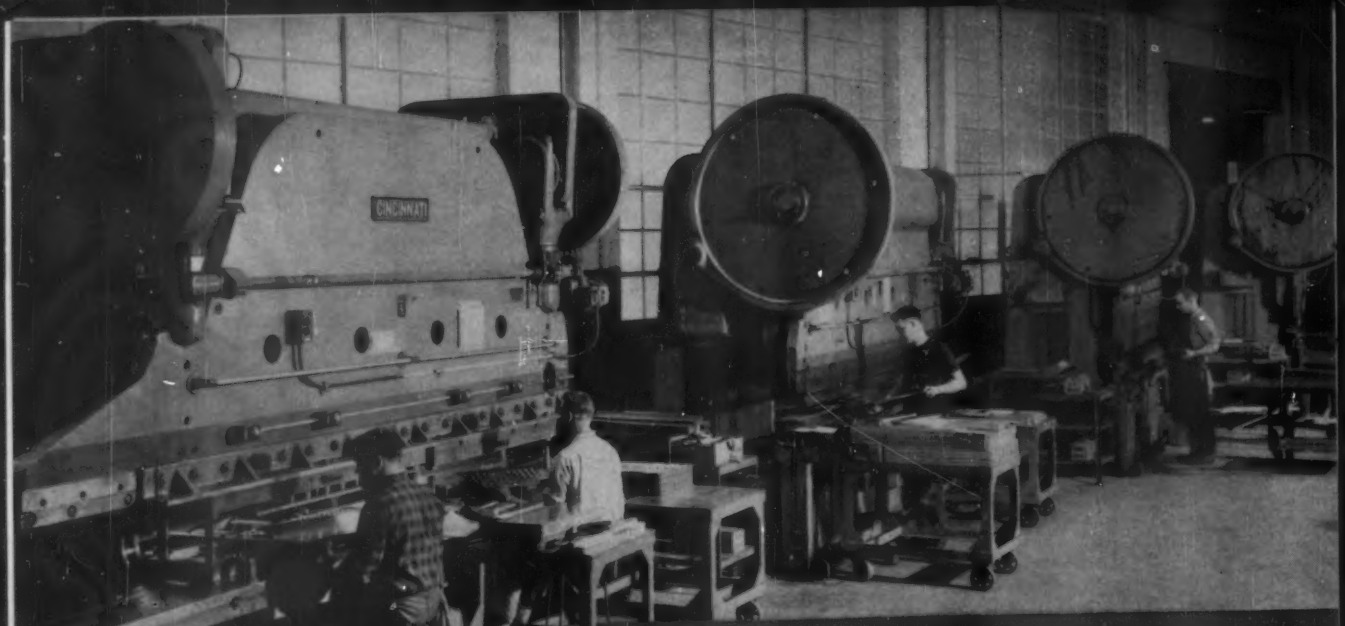
On machines acquired . . .

since 1953 and thereby subject to the 1954 tax code, 31% of the companies reported that they are using the double-declining-balance method of writeoff. Another 31% has elected to apply the sum-of-digits method. Both of these methods enable management to write off new machines much faster than by the straight-line method.

The trend is clear. More and more metalworking companies are no longer content to go along with an archaic policy of purchasing new equipment in hit-or-miss fashion. Instead they are taking the scientific and intelligent approach of seeing the matter through, from analysis of the savings to be made by replacement to depreciating the investment by the most modern method.

Just where does this leave you? Are you up-to-date or behind the times? The MAPI study provides a clean-cut answer, in case you are a laggard.

Burnham Finney EDITOR



at THE TRANE COMPANY, La Crosse, Wisc.

BATTERIES of accurate CINCINNATI Shears and Press Brakes cut production costs

Three Cincinnati Shears and four Cincinnati Press Brakes are profitable producers in this finely equipped shop.

The battery of shears produces accurate blanks sheared to micrometer accuracy, which are later formed and pierced on the Cincinnati Press Brakes.

The photo above shows multiple holes being pierced and extruded to a tolerance of ±.002" in a steel tube support plate for Trane cooling coils. On this operation alone, floor to floor time was cut from 2-1/2 minutes to 1/2 minute by the use of Cincinnati Press Brakes. The speed and outstanding accuracy of these Cincinnati Machines have lowered costs and increased quality of the air conditioning equipment manufactured by this leading company.

Write Department 7 for Catalog S-75 on Cincinnati All-Steel Shears and Catalog P-49 on Cincinnati Press Brakes. We also suggest you consult our Application Engineering Department about your shearing and forming problems.

CINCINNATI

THE CINCINNATI SHAPER CO.

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Full scale models of the satellites the US will launch, show end result in . . .

Building the Space Satellites

Here is the production story on the satellites for Project Vanguard. The thin outer shell and inner framework are built of magnesium by Brooks & Perkins

GEORGE H DE GROAT, Detroit editor

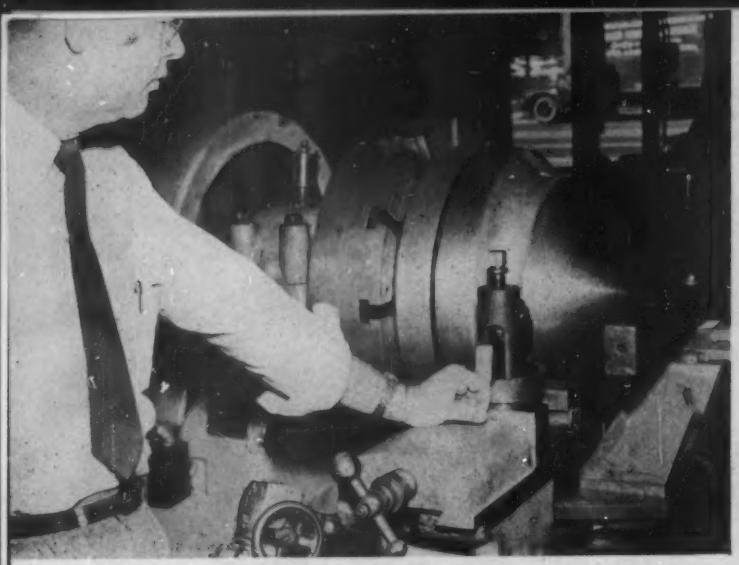
One thousand pounds of launching vehicle is required for each pound of satellite projected into an orbit around the earth. That is why the shell and framework are made of magnesium. Total weight of each satellite will be 4 lb, and each will carry a 17-lb load of instruments.

Project Vanguard—the launching of one or more satellites during the International Geophysical Year (July '57 to Dec '58)—is an Army, Navy, Air Force project under Navy management. The vehicle that carries the satellite into space is being built by the Martin Co, the first-stage rocket motor by General Electric, the second-stage motor by Aerojet General Corp, and the third-stage rocket by Grand Central Rocket Co and Allegheny Ballistics Laboratory.

The first two stages will raise the rocket cone to an altitude of 300 miles and a speed of 9000 mph. At this point the third stage will launch the satellite into its orbit at 18,000 mph. The contract for the fabrication of the satellites went to Brooks & Perkins (*AM*—Jul 30 '56, p69) and on the following pages we present the first story on the fabrication of the vehicles that will circle the earth in an orbit at an altitude that varies from 200 miles at the perigee to 1400 miles at the apogee.

HOW IT WORKS . . .

A three-stage rocket, 72 ft long and weighing 11 tons, will raise the satellite. First stage attains speed of 3000 mph; second stage, 9000 mph; third stage, 18,000 mph. At most distant point in its orbit, the satellite will be 1400 miles from the earth. Ten observation stations will track the satellites and receive data radioed back to earth.



Fixtures Perform Double Duty in Building the Space Satellites

Meehanite spinning block . . .
is turned with a concave groove that produces a pressure chamber in the lower hemisphere. This same tool is used as a draw punch to obtain a preformed shape for spinning

DOUBLE DUTY FOR SHELL PROCESSING FIXTURES

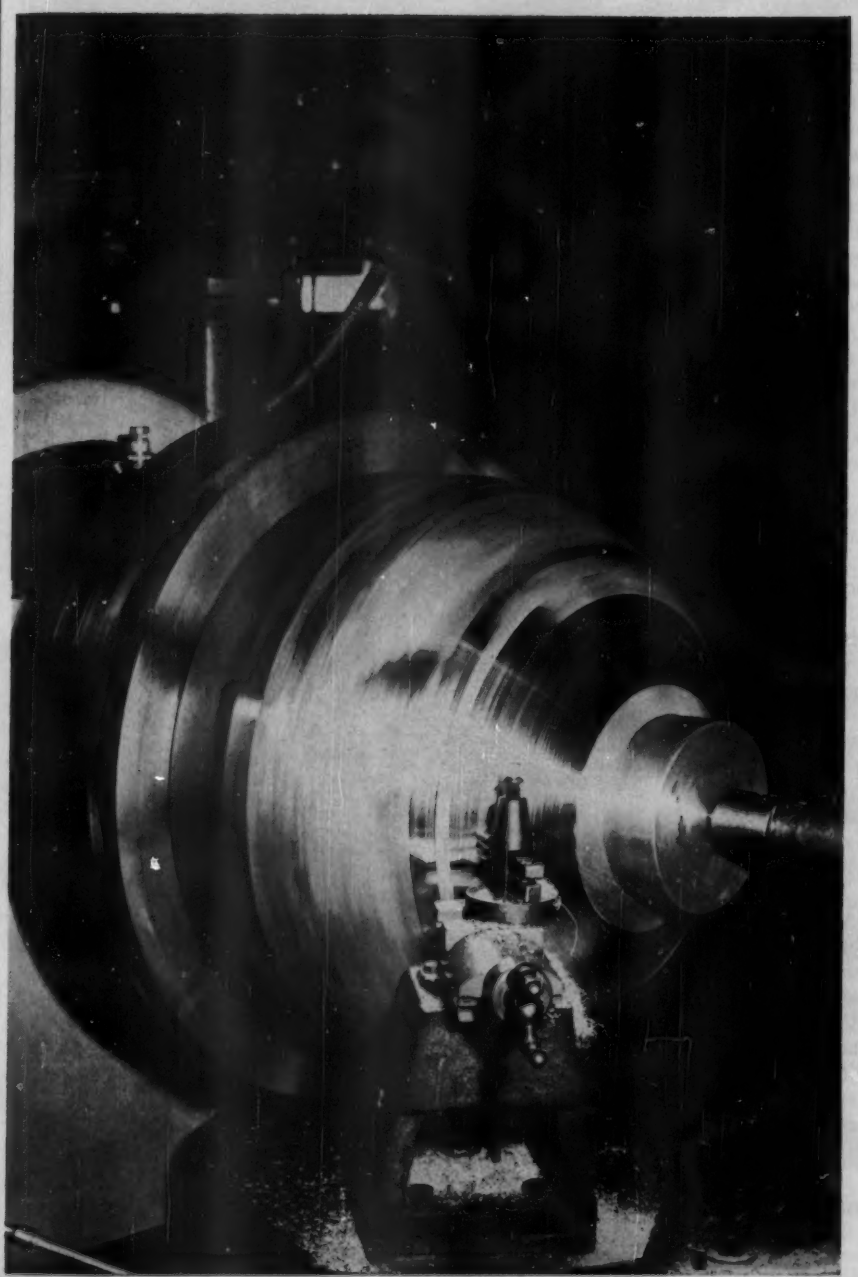
The complete shell for the satellite consists of an upper and a lower hemisphere and a cover ring. First operation in making one of the hemispheres is to deep draw 0.050-in. thick magnesium sheet. The material is AZ31 alloy consisting of 96% magnesium, 3% aluminum, and 1% zinc. Conventional drawing practice is followed for this operation with the sheet heated to 650 F. The draw die is made up of two rings and a punch heated to the same temperature. The flat blank is placed between the draw rings and pulled down over the hot punch. Springback is no problem and with the hot single draw no intermediate anneal is necessary. An interesting tooling trick employed in this operation is the use of a Meehanite punch made for later use as a spinning tool. Of course, the punch dimensions were made to suit the spinning operations but no close tolerances are held in drawing because this operation is performed mainly to get a preformed general shape. Trimming follows the draw when the metal cools and the rough drawn hemisphere is ready for final shaping by spinning.

The specific contour required for the satellite skin is produced on a spinning lathe where the stamping is formed over the Meehanite spin block previously used as a drawing punch. A fixed center in the headstock engages the spin block which is mounted on the lathe faceplate. At the opposite end, a live center in the tailstock engages an aluminum back-up block in contact with the face of the work. Heat from a gas torch mounted adjacent to the lathe brings the work temperature up to 600 F for the operation, which is performed at 380 rpm.

A concave section is spun around the periphery of the hemisphere to form a gas chamber or pressurized area in the finished satellite. By covering

Finished contour . . .

of lower hemisphere is examined at left above. Stages in production are shown at right above, with both drawing and spinning following conventional practice for hot-working magnesium. From left the steps are: first, preformed hemisphere as drawn; second, hemisphere after trimming and spinning; third, the spun cover ring; fourth, finished hemisphere with cover ring welded in place



Turning the hemisphere...

between centers reduces the skin thickness from 0.050 in. at the closed end to 0.030 in. at the open end. The same fixture that holds the work for this turning operation is employed as a welding fixture in joining the cover ring over the concave pressure chamber

Building the Space Satellite . . .

this depression later, an air tight chamber is produced into which instrument elements extend.

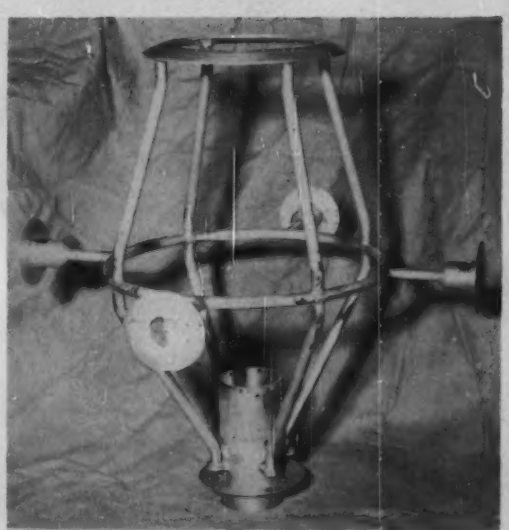
Under a specific pressure, this chamber with its instruments, will record the size and speed of any particles in space that might hit the satellite by registering variations in relative pressure. Any punctures, or even small dents, will produce an immediate effect on the instruments and a reading will be telemetered to earth.

The cover ring for this chamber is formed by spinning 0.040-in. magnesium sheet. First, the sheet is formed into a large cup shape, then a section corresponding exactly to the radius of the shell is cut out. The resulting bands are welded to the hemispheres after welding two bosses into the concave section of the shell. These are drilled and tapped for connecting the pressure chamber instruments.

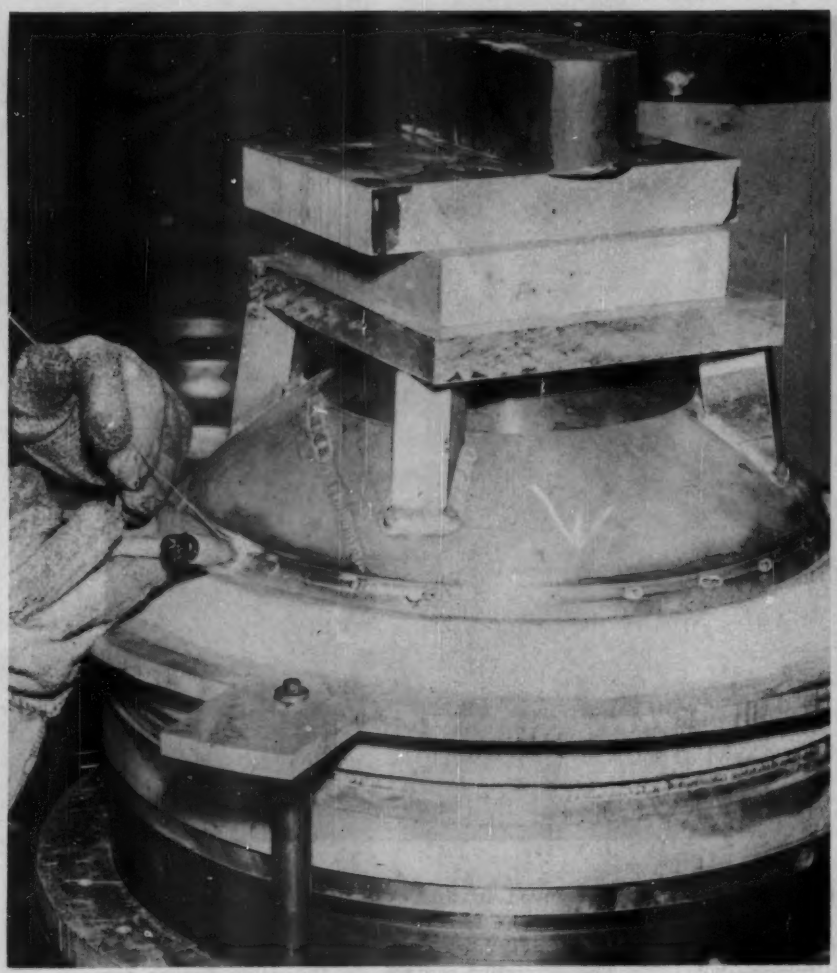
After spinning, the concave sections in the upper and lower halves are machined to close tolerances at the same time the outer surfaces are turned from 0.050- to 0.030-in. thickness. Skin thickness at the top end remains 0.050 in. with a gradual reduction in thickness to the bottom. Both hemispheres are machined in the same way so that the assembled shell has greater strength at the ends to withstand stresses. It was found in vibration tests that additional strength is need at the ends to withstand shock when the third-stage rocket is fired—especially at the end where the satellite is attached to the third-stage fuel chamber.

Turning the shells to close tolerances is done in a fixture that also serves a double purpose, this time to insure accurate alignment in performing two separate operations. The turning fixture is also used in the welding operation that follows machining, and is made of CI to dissipate welding heat. Here the pressure chamber cover is manually joined to the lower half of the shell by argon-gas shielded arc welding. According to latest instructions from the Naval Research Laboratory, the welding bead is not removed by machining after welding. A stress relief follows welding to remove strain setup in this operation.

Each hemisphere has an opening at the top. The upper half has a large access door opening to permit last minute adjustments to instruments before launching. The bottom half has an opening through which a tube extends from the completely assembled satellite to connect to the third stage rocket. In addition, the bottom half is provided with two openings for mounting instruments and four others for the projecting antennae.



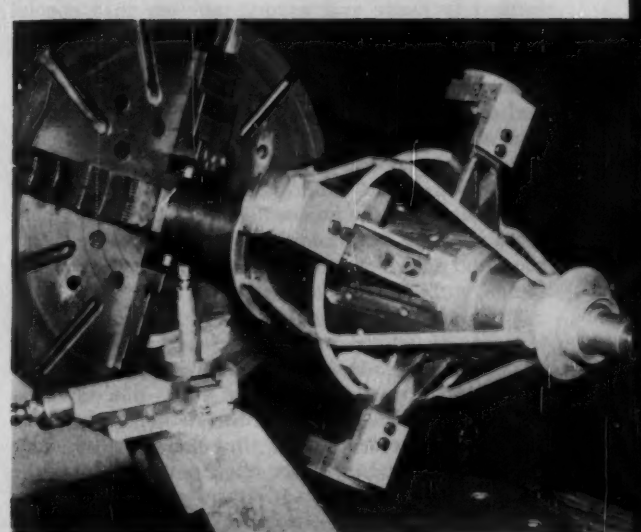
Welded internal framework . . .
is hot formed from magnesium tubing. Plate at top mounts access door, tube at bottom connects to third-stage rocket



Welding cover ring . . .
to the hemisphere by manual Heliarc gas-shielded metal-arc. After the cover ring is welded in place, the chamber is leak tested under 25 psi hydrostatic pressure to check the soundness of the joint

Pressure chamber construction . . .
is shown in the cutaway view below. Radius of the cover ring welded over the depressed chamber must match the spherical contour of the shell exactly. This chamber provides a means to measure the size and speed of particles that hit the satellite in space. Differences in pressure caused by denting or puncturing of the chamber are registered on instruments installed in the satellite

Antennae are mounted . . .
on the four plates extending from the center of the frame. Instrument mounting sections are machined from solid bar



Instrument mounts are machined . . .
with frame held in welding fixture. This light finish machining corrects for movement during welding

Building the Space Satellite...

Assembly... of hemispheres and internal framework is with instrument screws of various sizes after drilling and tapping holes with plate jigs and the same work fixture seen on the previous page. The same fixture is used also during the assembly operation. In this view the satellite is inverted with the upper hemisphere in place

FRAMEWORK TOOLING IS INGENIOUS, TOO

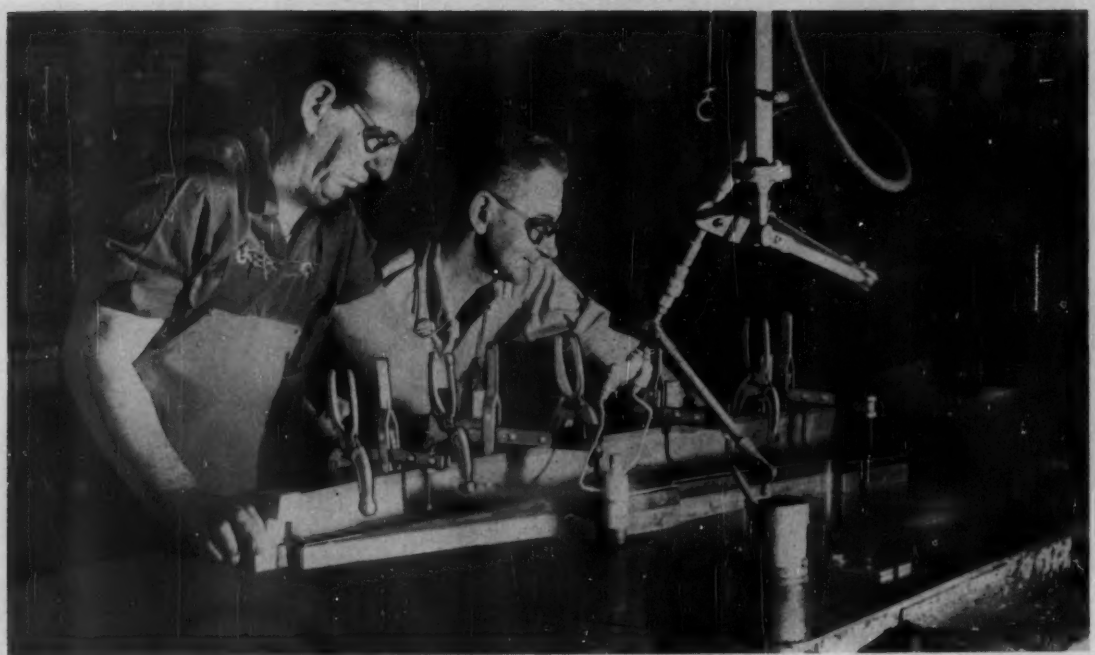
The internal framework for carrying the electronic gear is made up of welded tubing—hot formed to shape and welded together in a special fixture. This welding operation is also argon shielded, using ac current with a superimposed h-f ionization current to insure maximum joint strength and density. The fixture employed for this work is later used to support the assembled structure while instrument mounting pads are faced and also for holding the work while drilling and tapping holes and assembling the finished shell. In this way, there is no opportunity for misalignment between operations and squareness of the assembled unit is maintained within precise limits.

Four antennae mounts in the framework also serve as structural members to tie in the internal structure with the shell, or skin. These are joined to a circular tube and eight axial tubes placed vertically around the circular tube. Other framework components welded at this time are an access door ring and an end ring for the opening where the rocket connection is made. Here too, the assembly is stress relieved after welding.

With the welded framework in place, the fixture is placed between centers in a lathe for turning spherical surfaces on the end rings and the antennae mounting plates. Only a few thousandths of an inch are removed in this operation to insure accurate sphericity and to correct any slight movement that might have been made as the result of welding heat.

The assembly remains in the same fixture for drilling and tapping. Here, drill jig plates are used with the proper hole patterns. One is dropped over the end of the bottom half for drilling tap clearance holes in the rocket connection plate to which the tube is later mounted. Small air-powered hand tools are used for drilling these holes and hand taps are employed to produce tapped holes for the instrument screws used in assembling operations. Holes are also drilled and tapped at the antennae and instrument mounting pads. Approximately the same procedure is followed for drilling and tapping the upper half of the shell after which the halves are assembled in the same fixture.

Polishing the assembled shell to a 4 mu in. finish follows and the completed unit is thereafter mechanically handled to avoid injury to the surface by the touch of hands. After being loaded automatically into a hammock inside a crate, the polished shell is delivered to B&P's commercial division in Livonia, Mich where the entire outer surface is gold plated. Purpose of this treatment (done to a uniform thickness of 0.0003 in. within close tolerances) is to give the satellite maximum reflectivity and to permit visual tracking from the earth. Plated shells are returned to the main plant for final assembly.



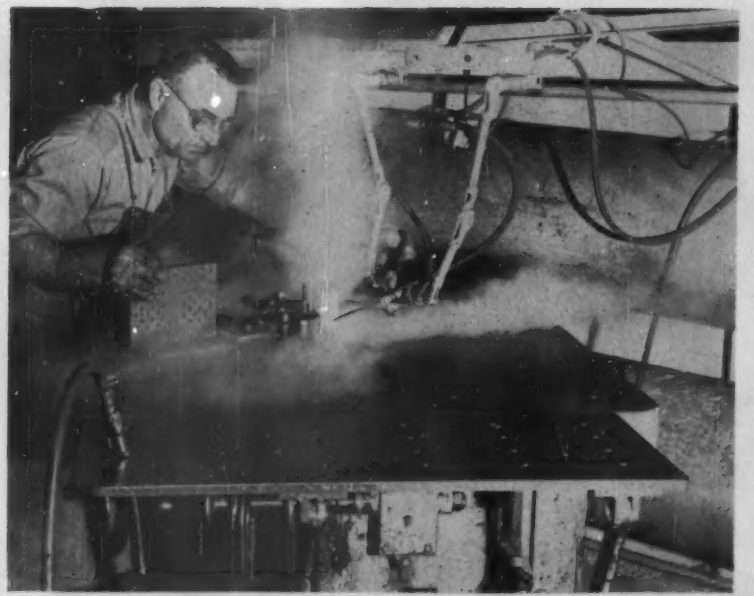
MOST ELABORATE of the setups is this Oliver wood shaper with extension tables of aluminum at each side. Two CO_2 jets, each 0.04 in. in diameter, supply coolant. Here an angular component of stainless, mounted on a magnesium tooling plate with quick-acting clamps, is being routed. In this case, the cutter is above the roller follower, which runs along the plate. Ordinary machine oil from the can at right is brushed on the roller follower and plate as a lubricant

Wood shapers rout superalloys at 2000 sfpm

. . . with CO_2 as the cutting fluid. Boeing Airplane produces parts of titanium, heat-treated 400 series stainless and 4130 steel, magnesium alloys, rubber, and plastics. Tolerances can be to ± 0.002 in., surface finishes equal to grinding. One 64-hr job was cut to 12 hr with this process

E J TANGERMAN, formerly executive editor

CO_2 is a controversial cutting fluid, frequently used initially on "impossible" cutting jobs, but generally considered expensive. Boeing Airplane Company, Seattle, has applied it, however, on a whole series of tough production parts. What's more, the problem of "smearing" in cutting stainless, some other alloys, plastics and rubber is avoided. Old Oliver wood shapers, left over from wood-pattern days, are put back to productive work. Spindle speeds of 5000 rpm and up are retained, and the tungsten-carbide-tipped cutters as well. Thus, in contrast to usual present reports of cutting speeds limited to 100 sfpm on the superalloys, speeds here are 1963.5 sfpm with a 1½-in.-dia cutter, and the excellent finish and close tolerances characteristics of such speeds are obtained. CO_2 is supplied from two Liquid Carbonic generators, one in the tooling area, one in production, and piped in ¼-in. line and hoses at 850-900 psi to using machines. There is also a portable CO_2 setup, wheeled to particular machines for short runs, one being a rise-and-fall router for long special jobs. All generators are supplied with ordinary 10-lb cakes of solid CO_2, the permanent installations being refilled weekly. Carbide-tipped shaper cutters are used. *(next page please)*

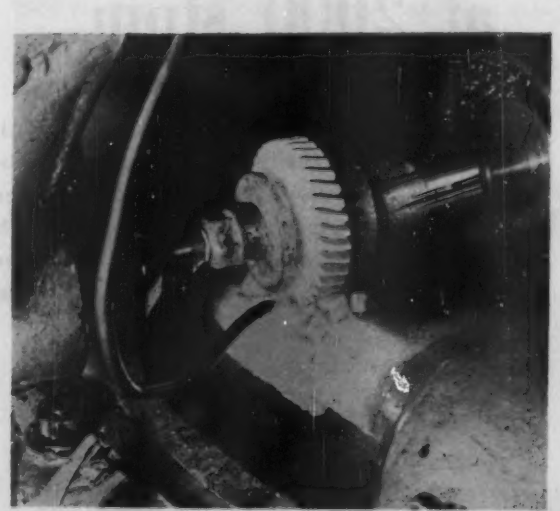


HEAT-TREATED 4130 STEEL is being cut here in the fabrication area. Note the twin tanks of the generator at right—really only two heavy-duty tubes with bolted heads, capable of withstanding 900 psi. The cutter here is frosted from the single-tube jet, as is common in CO_2 practice. The jet is mounted on a pair of arms like those used for worklights, to permit quick adjustment. No exhaust equipment is needed, because ventilation is excellent in this high-bay area

Wood shapers rout superalloys . . .

CUTTER TYPES total 75 to 100, from ½- to 3-in.. diameters (which means 4000 sfpm!). Cutters are guided by the roller followers in the lower drawer, either above or below the cutting edges, depending on setup. Roughing is done with a roller 1/32 in. oversize, except on stainless, where a 1/64-in.oversize roller is standard to avoid grabbing. For finishing, the roller is the same diameter as the cutter, and tolerances to 0.002 in. are commonly obtained, with excellent finish. Rollers are usually bronze, for ease in machining to desired diameter if necessary

TYPICAL OF SMALL PARTS machined and finishes obtained are these two, that at left of titanium, at right of 4130, heat-treated. Such parts are commonly made in lots of 10 to 50, so fixtures are simple—frequently a plate with a quick-acting clamp. Large flat parts are, in fact, worked on the wide-table machine on occasion, held only by lead weights

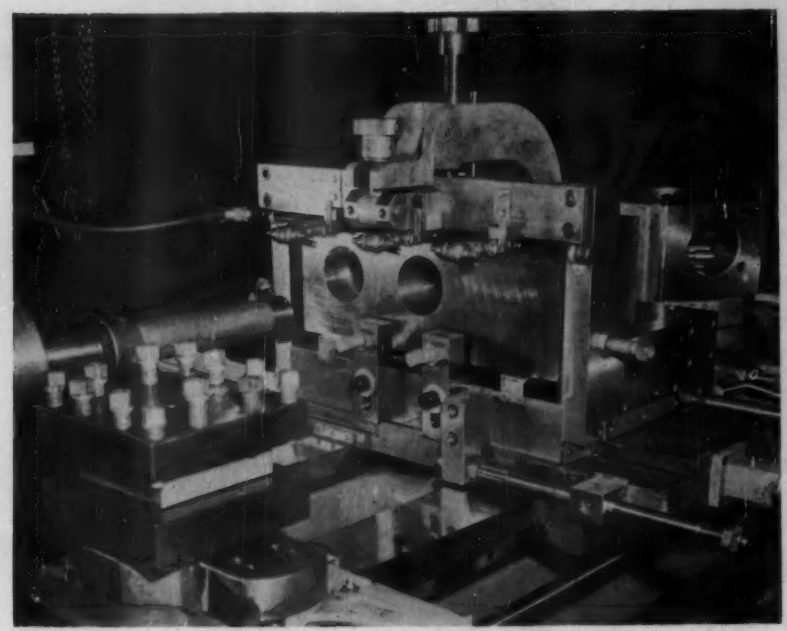


Ti gears also hobbed with CO_2 . . .

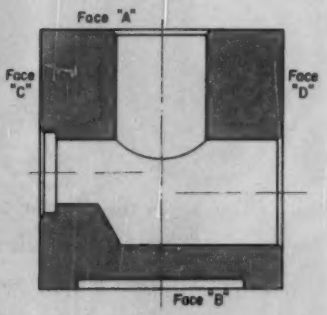
Included in early Western Gear research on titanium was the use of CO_2 during hobbing. Both gear blank and hob were frozen, and the condition maintained during hobbing. Titanium alloys have since been improved, which results in easier machining of the material. Western Gear Co pioneered in titanium research as applied to mechanical power-transmission equipment

Precision bore in turret lathe

A 5500-lb fixture set by crane and driven by turret slide precision bores small steel cylinder blocks

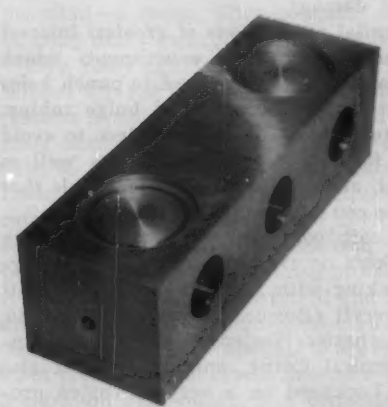


Centering adjustments and supporting carriage for the fixture, built for Ajax Iron Works, Corry, Pa, are clear here. Because job lots do not justify single-purpose equipment, machine, a 3L saddle-type Gisholt, is also used for conventional work. Tools are held in a quick-changing, spindle-nose fixture

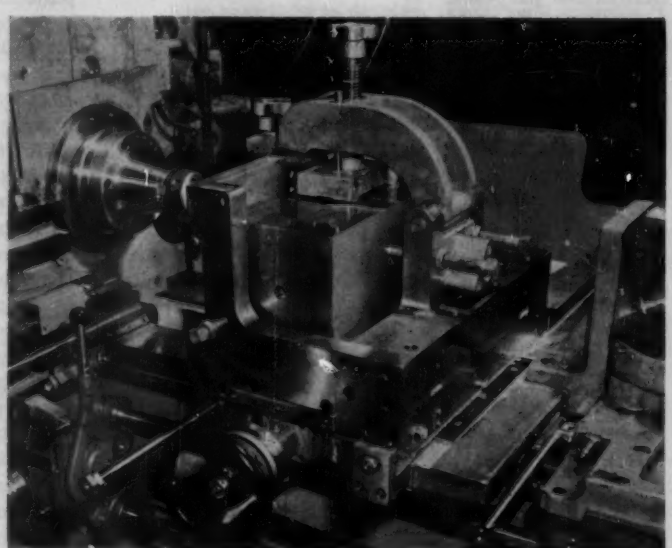


Sequence of operations for each of the three holes in faces A, C and D is: (1) centerdrill, (2) drill to depth, (3) rough bore, (4) semi-finish bore, (5) finish bore, (6) counterbore (in *C* only), and (7) chamfer. Each hole is held to within 0.002-in. of the center-to-center distance. Faces *A*, *B*, *C* and *D* are machined in that sequence

JOHN L ANDERSON, chief tooling estimator
GISHOLT MACHINE CO, MADISON, WIS



Flat-bottomed holes in face *B* (top) are centered with the two outer holes in face *D*. Positive stop and clamp locate piece for first series of holes; a centering plug in fixture assures alignment of other holes with those in face *A*



Movement along bed is achieved with regular turret-feed mechanism by bolting fixture to turret. Manual crossfeed leadscrew provides for indexing between positions on the same face of block. Standard cross slide is forward and out of way

Shock Forming with

Is the answer to looming problems in fabricating the high-tensile stainless steels and the titanium alloys another conversion of wartime energy to peacetime use? Gunpowder and stronger explosives show real promise in punching, upsetting, forming, expanding, swaging, cupping, bulging, and otherwise working the "impossible" materials. They move the metal before it has time to crack. Here's a roundup on experiments to date

E J TANGERMAN,
formerly executive editor

The cyclone that drives a straw through a much harder tree, the "pop" of a champagne-bottle cork or a firecracker, and the disintegrating force of high explosives—all of these have one characteristic in common: they all result from sudden release of energy at high velocity. Until recently, we haven't been able to harness this energy for anything but destructive purposes.

Probably the first instance of harnessing this energy was in the Temple gun (*AM*—Feb 6 '30, p245-248, "Gunpowder Deserts Mars for Vulcan"), which utilized a powder charge to drive studs into ship plates under water. This gun, resembling a yoke-handled riveting gun, actually delayed release of the stud-driving plunger until desired pressure was built up. A necked breakpin (¼-in. dia necked to ⅛ in. for driving ½-in. studs) enabled much higher velocities than those produced by the same powder charge in a rifle. A ½-in. stud was driven into ½-in. plate with 21 grains of powder, a ½-in. stud into 1½-in. plate with 48, as compared with 28 grains in a 12-ga shotgun shell. Because powder charge and breakpin size were both controllable, the gun could drive a stud to predetermined depth, or a punch clean through.

Since World War II, there have been increasing numbers of applications for cartridge-actuated devices, most of them connected with military applications. In fact the new science has even been given a non-descriptive name: packaged power. Cartridges have been devised to fire rescue lines, fishing lines, pilots on their ejection seats, parachutes, instrument containers or used-up fuel tanks from missiles. Others tack rugs, drive studs into steel or concrete, start jet engines, explode bomb rack or bomb sights when a plane crash lands, cut or splice cable, clean out slag from furnaces. Still others are proposed to actuate auto jacks, to lift mired vehicles, to mark roads instantaneously in auto-brake test programs, to inject fertilizer into the ground or trees, to pollenize trees, to set off fire extinguishers, to activate a 60-sec emergency-power-supply turbine for radio transmission, to clear forgings from dies and castings from molds, and to drive broaches at 10,000 fpm — if some way can be devised to stop the broach without damage.

But the potential applications of greatest interest to Metalworking are current experiments which indicate that cartridges may be used to punch holes in high-strength alloys to flare and bulge tubing, to form "non-formable" alloys of stainless, to avoid springback in forming titanium alloys, as well as to swage, upset, and cup shapes and materials that no other process can handle thus far.

Several aircraft companies are working with explosives makers on trial programs. Winchester-Western is working with Ford Motor Co and Pratt & Whitney Aircraft (Business Week — Oct 27 '56, p135-136). Winchester-Western (a division of Olin-Mathieson Chemical Corp), and duPont are also working with Lockheed on a very extensive program, here reported in detail. Convair has also done some experimenting.

Basically, the principle is to release energy at such high rates that — as one researcher put it — "the metal is punched or formed before it knows

Explosives

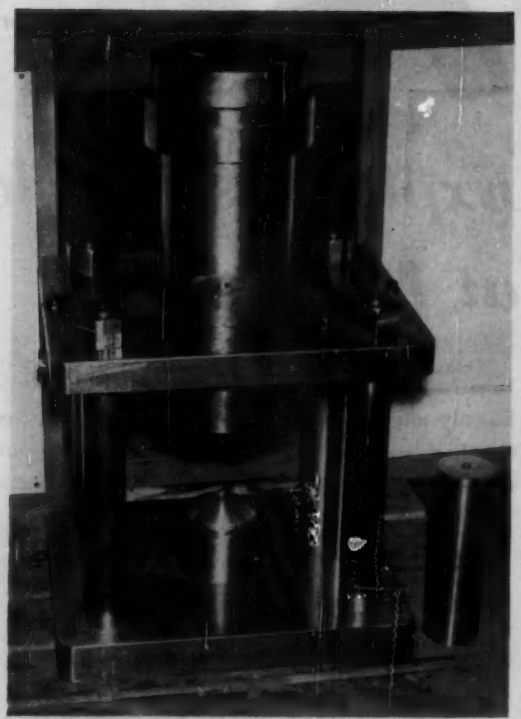
what happened." Or, in more sober terms, the metal molecules are rearranged so rapidly there isn't *time* for the sound wave that causes cracking to start. The whole idea is very reminiscent of the time-honored technique of pulling baby teeth, or the parlor trick of yanking away the table cloth without disturbing the dishes.

"An explosion," says T L Davis in *The Chemistry of Powder and Explosives,* "is a loud noise and the sudden going away of things from the place where they have been." For centuries, only the loud noise had any practical application — the Chinese used the flash and bang of a bit of black powder rolled in paper to scare away devils.

Presumably, the curious fellow who rolled a bigger firecracker than anybody else found that it could remove more material things than devils. And the still-more-curious fellow who packed powder into a tube with a fuse, closed at one end and with a stone at the other, ended one age in history and started another. His charcoal-sulfur-saltpeter combination has been refined into explosives of fantastic power, delivering force at four miles a second. Fantastic weapons have been developed to use these explosives in warfare—the usual course of development. Perhaps now we can divert that force into industrial potential—a cheap, ultra-powerful and (believe it or not!) easily controlled source of power.

Two years ago (*AM*—Oct 25 '54, p173), we described the use of dynamite over water to bulge a massive monel cylinder in a heavy-duty die. Now we have Glen Rardin's account of his experiments to date in a 3-phase pioneering research program at Lockheed, and a summary of relative energy-release rates of various energy-storage devices to give you some perspective on the idea. And you'll need it, because here's the kind of thing already being done: A 260,000-psi material required one to ten 3/16-in. drills per hole with high-pressure feed and heavy flow of cutting fluid. Punching in conventional equipment created radial cracks around every hole. With a captive-piston punch in a converted stud driver actuated by .22-caliber blanks, clean holes were punched with ease for less than two cents per hole.

We are apparently on the threshold of a new principle, namely, that brittleness of a material is purely relative to the speed with which it is hit.



A typical press for "shock forming"

This miniature press was built at Convair, Division of General Dynamics Corporation, to investigate the feasibility of using an explosive in the trapped-rubber forming process. The idea here is to form difficult shapes in difficult materials "before wrinkles have time to develop." Equipment is basically a miniature drop hammer, actuated by a 12-ga magnum shotgun shell with shot removed. There is the conventional form block under the miniature ram, and the latter has a chamber at its end filled with rubber. The rubber, trapped between form block, anvil and the hammer or ram, forces the piece to be formed over the block.

A breech block with firing mechanism is bolted on top of the device and seals off the firing chamber where the explosive is contained. On each side of the ram is an adjustment for varying firing-chamber size, thus controlling pressure on—and the velocity of—the ram. Near the end of ram travel, burned powder and expanding gases are vented through ports in the cylinder wall uncovered as the ram passes them.

Experimental work is still going on with the device at Convair covering various explosives and sizes of charge. Experiments thus far have been encouraging, and the Air Force is showing considerable interest.

Shock Forming...

Explosives Fabricate Metal at Lockheed

In a "program motivated by necessity," Lockheed has already found out some startling things about the high-strength metals. Here the author summarizes results to date in the 3-phase program

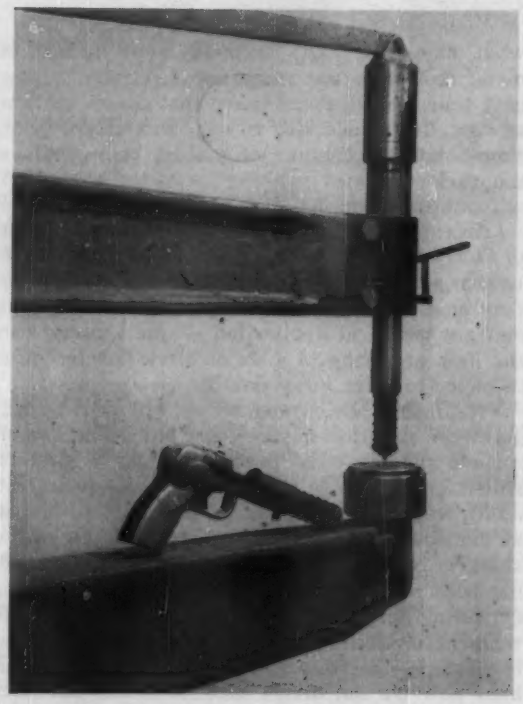
GLEN N RARDIN,
production methods engineer
LOCKHEED AIRCRAFT CORPORATION, Burbank, Calif

Our program is motivated by necessity. As the speed of aircraft approaches the "heat barrier," stronger and more-heat-resistant metals must be used to fabricate the airframe. Because good aerodynamic lines are necessary to achieve high performance in airplanes, it will be necessary to form this high-strength metal into complex curvatures and shapes. With existing hydro-press and drop-hammer equipment and known production methods, such forming is impractical. Therefore, Lockheed has decided to explore the field of explosives as a source of pressure for forming metal.

Limited research has proved that most metals react differently under impulsive loading, such as an explosive, than under conventional loading, such as a hydro press or drop hammer. Greater elongation and ductility are usually evidenced, and the entire pattern of behavior is altered. As the metal being formed absorbs part (and sometimes all) of the energy of the explosion, work-hardening characteristics are changed and grain structure may be altered.

The velocity at which the load is applied to the metal can produce many different results. Each alloy has its own critical velocity. Too fast a shock wave may shatter it to fragments, while a reduction of a few hundred feet per second will give good plastic flow. These factors are, at present, mostly theoretical. Before we will be able to state that a 4-in.-dia cup can be formed from heat-treated Type 420 steel with a charge of x number of grains of y explosive, a great deal of research must be done.

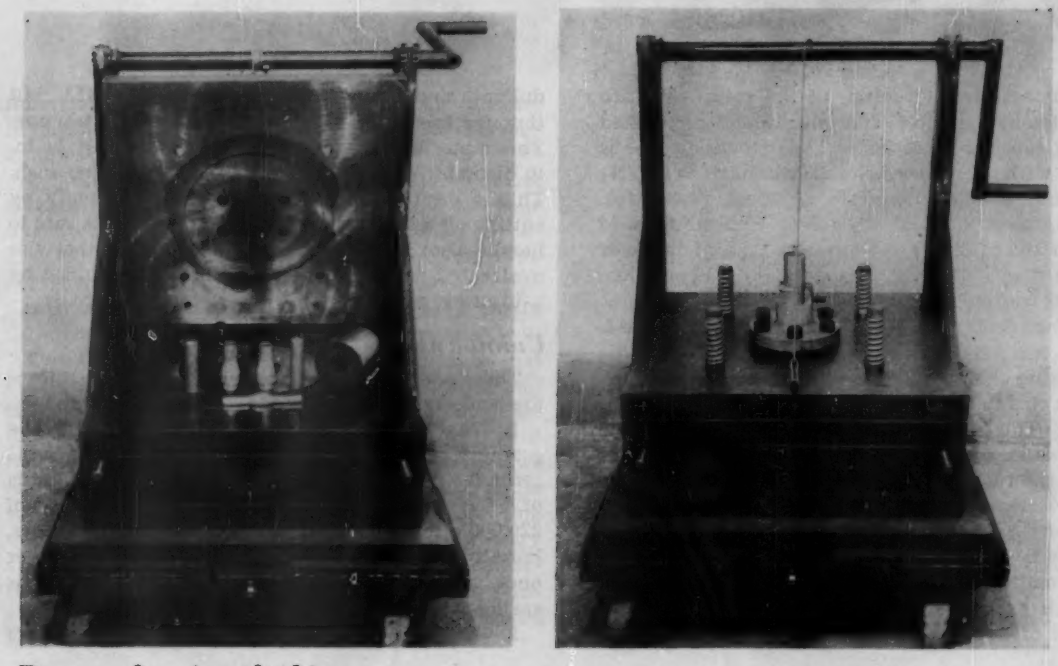
The two basic types of explosives can be called low explosives and high explosives. The former are propellants which contain within themselves all the oxygen needed for their combustion and which burn rather than explode, thereby producing gas which expands to produce pressure. These are the various powders used for ammunition and are obtainable in burning rates which vary from extremely slow blasting powder to high-velocity smokeless pistol powders.



Both portable and stationary tools . . .
have already been developed for punching, dimpling and riveting high-strength materials. Phase I

High explosives are detonated by the shock of a primary explosive such as mercury fulminate or lead azide. These explosives do not function by burning, but by decomposition of the constituents (some are incombustible) and are the most brisant and powerful substances man has compounded, some having shock-wave velocity of well over four miles per second.

Our research program is planned to investigate the effect of both types of high-strength metals, as well



Pressure forming of tubing . . .
is done with low explosives in this pressure forming die. The upper plate, carrying the firing chamber and lockbolts with relief springs, is lifted away from the lower plate, carrying female die in a pressure chamber, by a simple cable hoist. The whole rig is on a 4-wheel truck. Phase II

as to develop methods and equipment for safely utilizing this source of energy industrially.

The Lockheed explosives-research program is divided into three phases. All three are directed toward solution of the problem of fabricating airplane parts from high-strength materials.

Phase 1: PUNCHING HOLES

Phase 1 consists of perfecting a tool for punching holes in sheet metal too hard to drill by conventional methods and installing fasteners which, because of high strength, cannot be installed by pneumatic or electric tools. The basic tool is a converted stud driver. It is a captive-piston gun, using .22-calibre stud-driver shells. The explosive force of the shells drives a piston at a rate of about 800 ft or more per second. The tip of the piston is a hardened punch which, at the end of its travel, protrudes from the muzzle of the gun about 1/16 in., then retracts to firing position for the next shot. Of course, the trick is to stop three ounces of steel piston travelling at about the speed of a .22 bullet, without disintegrating the gun. This has been accomplished.

We can punch clean holes in steel sheet of 250,000-psi tensile strength without cracking the surrounding metal. When stronger sheet material is available, we feel confident that hole punching will present no problem. Initial experiments without a die produced clean holes, but they were slightly dimpled. With a die, dimpling is avoided.

The same tool can be used to upset high-strength fasteners (such as 200,000-psi rivets) and perform various swaging operations. Powder loads are available which will impart adequate impact force to the piston for all contemplated uses.

Phase 2: PRESSURE FORMING WITH LOW EXPLOSIVES

Phase 2 is pressure forming of metal. This is accomplished in an enclosed die using a powder charge (low explosive) as pressure source. The amount of presssure used is limited only by the strength of the die and firing mechanism. We are using a firing head and 8-gauge shells (1-in. dia) loaded with smokeless powder. Pressures up to 50,000 psi are safe with present equipment. Olin-Mathieson is cooperating in Phases 1 and 2.

Our initial experiments are being conducted on steel tubing such as 4130 and 347. Using a female die enclosed in a pressure chamber and charges loaded to a known psi in a given volume, we are expanding tubing and forming it to various shapes. This method utilizes gas pressure applied to the inside surface of the tube to form the metal.

Phase 3: PRESSURE FORMING WITH HIGH EXPLOSIVES

Phase 3 is the use of high explosives. Simple cup forming was chosen as a beginning to investigate elongation, work hardening and the effect of shock-

Shock Forming...

wave impact upon structure of the metal. We are using detonating fuse and electrically detonated blasting caps for these tests. The detonating fuse is loaded with Pentaerythrite Tetranitrate (PETN) which has a detonation rate of about 26,000 fps. With 9 grains of PETN fired 4 in. above full-hard stainless steel (72 R_b), a depression 2 in. in diameter by ½ in. deep was made. In the pit of the depression, hardness was increased to 74 R_b—up only two points. E I duPont de Nemours & Co are assisting in Phase 3.

A die has been made consisting of a cupping die and a firing chamber. The explosive is detonated inside the chamber a few inches above the metal to be formed. This is done by attaching the detonating fuse to an electric blasting cap and leading the wires outside the room to a twist generator which initiates the explosion. A concrete bomb shelter is used as a laboratory. We have formed full-hard 302 Crescent steel far beyond the elongation possible by conventional methods. Several other methods of forming with this explosive are scheduled to be tried. Explosives of a given velocity can be obtained from duPont, and Primacord—introduced in 1913, but thus far used only for demolition—looks attractive. This material comes as a flexible cord about ¼ in. in diameter, with a fixed number of grains per inch. Thus a desired energy can be obtained simply by cutting off a suitable length. The explosive is safe to handle also; it can be cut, hammered and otherwise mistreated without danger. It must be exploded by a blasting cap.

Unknowns

There are still many unknowns, of course. Here are some typical ones:

1. What pressures are generated by exploding one grain of PETN, for example, contained in one cubic centimeter? Best figures available are that 1.6 grams of PETN detonated in 1cc produces a pressure of 220,000 atmospheres, or 3,234,000 psi. These figures, hard to visualize, are nevertheless ± 20%, and closer ones are needed for designing such elements as spring-loaded safety heads.

2. What happens to grain structure moved at 4

Energy alone isn't the answer . . .

A woodcarver strikes the long wood handle of his chisel with a wooden maul. The machinist uses a steel hammer on a steel chisel shank. Why? Because the woodcarver wants, relatively, a shearing *push*, while the machinist wants a cleaving *blow*. The paring slash of the wood chisel and the sudden smash of the cold chisel are each best suited to its job. Although kinetic energy of the blows is the same, wood of handle and mallet head transfer the stored energy at a slower rate than steel-to-steel. A quick high-energy blow is necessary to cut the fibers of metal; a slower push cuts wood rather than smashing it.

Again, a millwright uses a steel "battering ram" to loosen a crankpin or balky key. He hangs a heavy bar from a rope and swings it end first. Swing the bar sideways or coil it into a spring and it will not deliver the same smashing blow, even though the kinetic energy is obviously the same.

These principles we all know — whether or not we remember the physics involved. But we may forget to apply them on new problems. Somebody remembers—and we have a new metalworking process that solves a current headache.

Cases in point are plentiful:

1. Feedscrews on the 10-ton column of a horizontal boring, milling, and drilling machine "wound up" when the motor started, then overcame static friction and jumped the column 0.002 to 0.005 in. along the ways. Somebody at G A Gray added the "Electronic Woodpecker" — a weight that hit the ways and broke static bond just as the motors started. Result: less "windup," and the desired small movement of 0.0002 to 0.0003 in.

2. Eugene Clarke opposed two equal-mass rams, and put behind each a timed "shot" of air. Result: the Impacter, that delivers a forging blow many times harder (not just twice) than a ram powered in the conventional way.

3. Boeing engineers add latches to the ram of a Cecostamp, so the pressure builds up, then the ram is suddenly released. Result: a couple of times the forging power.

4. Convair engineers develop a cylinder with an added diaphragm and valve on the piston, again so pressure can be released suddenly. Result: the "HyGe," now being developed as a test device that can provide any desired pressure curve for testing, and as opposed-piston press with controllable, very-high impact velocities.

5. Some 25 years ago Norfolk Navy Yard developed a gun using a blank shell that drove a stud into a ship's plate under water, enabling patching of a hole without drydocking. Lineal descendants include the modern stud-setter. One of these can drive a 3/16-in.-dia stud into undrilled concrete so solidly that it will support a 15,000-lb hanging load from then on.

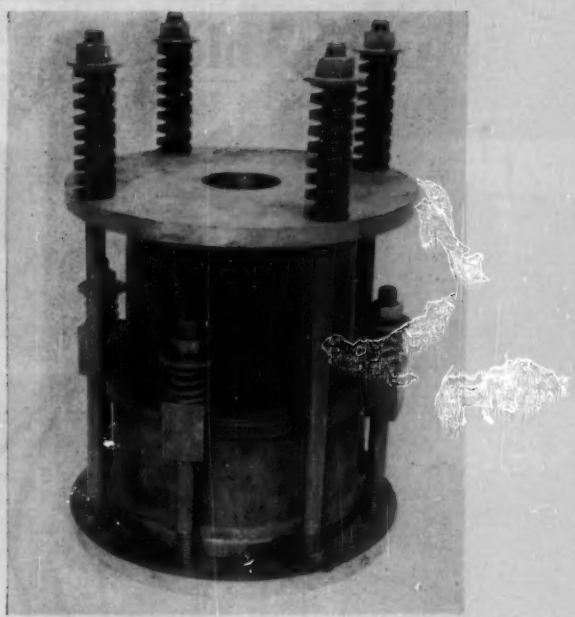
6. "Shaped charges" developed toward the end of WW II, with limited size and power, would drive

miles/sec? One test specimen showed an increase in hardness of only two points R_b. But what of deeper draws and other materials?

3. Punch or piston now disintegrates after about 50 shots. This appears to be solvable by a change in material now being undertaken.

4. Initial velocity of high-velocity smokeless powder is expended in 1¼ in. of piston travel, so this limits stroke. Current devices spill gas pressure through ports right after this point is reached.

Our limited experiments have convinced us that explosives have a constructive place in industry and that, with properly trained personnel and adequate facilities, they are a safe and economical method of fabricating high-strength metals. Restrictive laws and ordinances, local, State and Federal, will cause some confusion and trouble for anyone embarking upon a program of this type, but by clearing every step with plant safety engineers and using common-sense precautions, you will find no more danger involved in this method than in many of our accepted methods of fabrication.



Forming of plate samples . . . with high explosives has been done in this die set-up. Phase III

. . . SPEED OF RELEASE MAY COUNT TOO

a hole through armor plate that a normal projectile couldn't penetrate.

7. High-velocity missiles that make the heaviest armor plate a joke. The energy of the projectile is so great that it will penetrate hardened plate with ease.

8. A new machine of faster design was no good because the counterweights that held followers against cams failed to operate fast enough. Replacement with springs solved the problem. The force of gravity simply couldn't deliver energy fast enough, just as it can't in modern machine feeders.

These all deal not with energy itself, but with the *speed* of its delivery. After all, a pound of sewage contains more energy than a pound of TNT — the lethal difference lies in the speed with which that energy can be released by the explosive.

SOME RATES OF ENERGY RELEASE

A steel bar in direct tension is a poor spring — it can only store 7 or 8 ft-lb of energy per pound of steel. In torsion, the shaft can absorb as much as 46 ft-lb — six times as much. And as a helical spring the bar can absorb about 88 ft-lb per pound.

Early flying-machine models worked before the airplane did because their power came from energy stored in twisted rubber bands — which can store up to 3000 ft-lb per pound.

Flywheels of CI can store 640 ft-lb per pound of rim, steel ones about 3200 ft-lb per pound. But the steel periphery of a steam turbine at high speed can store as much as 31,000 ft-lb/lb.

Batteries can store about 22,000 ft-lb/lb, but many small ones do not exceed 3000 ft-lb/lb of weight.

Air compressed to 2000 psi can deliver up to 50,000 ft-lb/lb, steam expanding from 250 to 2 psi absolute can deliver 240,000 ft-lb/lb. This suggests a possible return to steam as the power behind an opposed-piston hammer if alloys get tougher.

Carbon, burned as a fuel, with air, can deliver about 900,000 ft-lb/lb of mixture. Fuel oil, a hydrocarbon mixture, can deliver 983,000 ft-lb/lb on the same basis, because hydrogen burned in air delivers 1,362,000 ft-lb/lb. Mix hydrogen and oxygen correctly, ignite with an electric spark and you get 5,400,000 ft-lb/lb.

Gunpowder delivers a million ft-lb/lb, an artillery shell around 100,000 — but they deliver it almost instantaneously. The rate, not the amount, is what does the damage.

A meteor hitting the earth at 7 miles per second delivers 20,000,000 ft-lb/lb. But try to stop the spin of earth, and it will deliver 149,000,000 ft-lb/lb. And the atom bomb can loose up to 15,000,000,000,000,000 ft-lb/lb! This may explain why the physicists are in general in favor of using atomic energy peacefully — even suggest potential metalworking use if tensiles on materials to be worked continued to go up as is now indicated.

Round Table

Public Payroll

"I wish there was some way we could squash these claims for raises we always get, Al. I get mighty sick and tired of fighting off everybody who thinks he's underpaid—which includes just about every man in the shop."

"I've got a cure for that, Ed. Why don't we get Management to post all the rates of pay on bulletin boards. That will shut some of these guys up; especially the ones that are already getting high rates."

"That's a hot one, Al. I want to cut down the trouble, not increase it. Management would never do that. And besides, the men would just look the list over and come back at us with new ammunition."

"What makes you think they'd get any ammunition from the pay schedules, Ed? I think they'd shut up. After all, our shop is so regulated and full of red tape on pay increases, there really isn't much difference in pay rates. About the only big jump is from learner rate to full mechanic's rate."

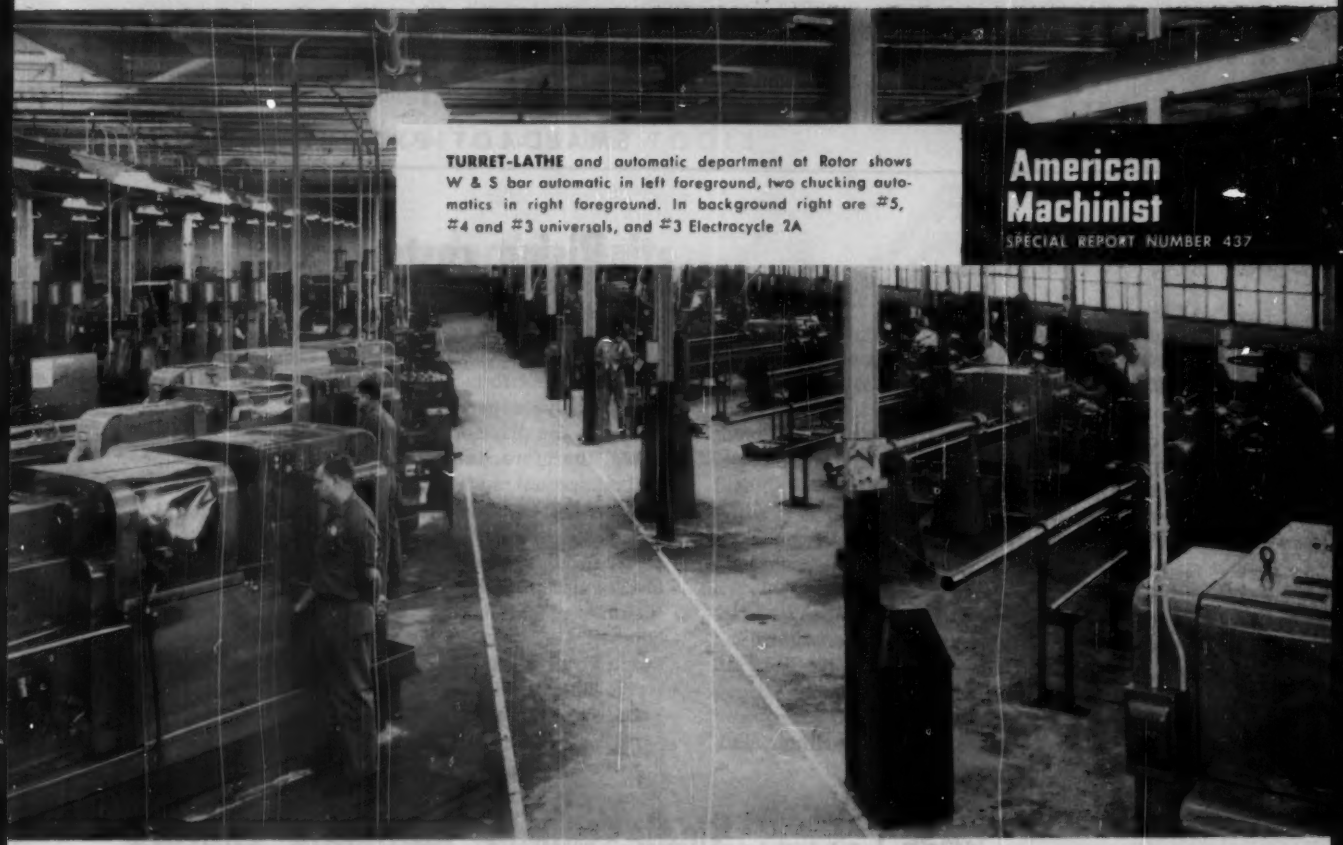
"Still, Al, there are enough slight differences to cause trouble. Anyone who found himself a bit under his mates would get jealous and angry. We might even lose some good men. That's a hare-brained scheme."

"Look at it this way, Ed: If everyone knows what everyone else is making, there at least can't be any mysteries or false impressions about who's getting what. That in itself should cut down on the gripes. Practically all of our top mechanics make the same rate, and they're not going to get raises until the next union contract is signed. That should settle a lot of trouble right there. Some of the rest of them get less, but in most cases you can easily show why they're worth less than the top men."

"Just like Washington, eh? I understand that there's a lot of petty jealousy because Civil Service has public rates of pay. I think we'd just get into hot water, Al."

"How can we have more trouble about pay rates than we already have?"

IS Al's idea good, or would it just cause more trouble? Is Ed right in saying that Management would never allow it? Your ideas on the subject may help others. Discussions of earlier topics start on page 194.



TURRET-LATHE and automatic department at Rotor shows W & S bar automatic in left foreground, two chucking automatics in right foreground. In background right are #5, #4 and #3 universals, and #3 Electrocycle 2A

American Machinist
SPECIAL REPORT NUMBER 437

We save money by putting SMALL-LOT PRODUCTION ON HIGH-PRODUCTION MACHINE TOOLS

H P BAILEY, president
ROTOR TOOL COMPANY, CLEVELAND

Nine proved case studies (six in detail), five others under consideration, a practical and basic policy, simple analysis without formulas, and dozens of pointers for small plants—all are included here. Rarely have we been privileged to publish such a candid evaluation of the problems of a small plant in equipment selection. Basic pressures are typical: labor costs are up four times, equipment costs three and a half, while selling price of the product is only doubled. However, by following the policy here outlined and explained, Rotor has held manufacturing costs in line with selling price for twenty years.

Here are blueprinted such ideas as the effect of reduced lot size, the value of old equipment, shortcutting elaborate calculations, use of a manufacturing committee, five-year-growth plan, figuring "time to repay," comparing various processes and machines, repairing or replacing old equipment, avoiding too-fast write-off. Mistakes are frankly admitted, to help others, because this author pulls no punches.

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Rising costs forced us to

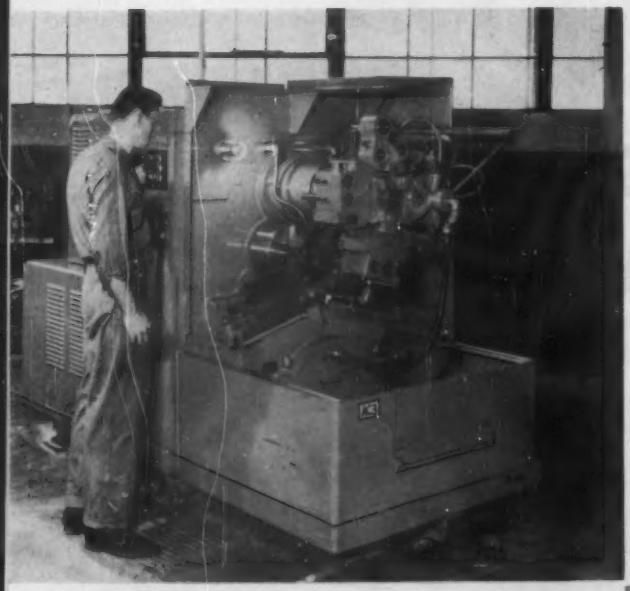
The problem of cost of small-lot production of metal parts held to close limits is a common one. Since April 1, 1937, our cost of labor has almost quadrupled. The cost of manufacturing equipment is now at least 3½ times, sometimes more, but the prices received for our finished product, portable air and high-cycle tools, have only doubled. Meanwhile, the availability of trained and skilled operators has been declining steadily for many years, so our basic problem is to hold costs in line with selling prices. This problem constantly becomes more difficult.

To meet the problem, we have endeavored to keep our manufacturing equipment and processes up to date, but we feel that the inherent productivity of today's machine-tool equipment has far from kept pace with its increase in price. Today's standard machine tools, like turret lathes, milling machines, and drillpresses, have more power, higher speeds, are built to use carbide cutters, and so on, but the improvement in production as a result of these features over a 20-year period is only a fraction of the increase in the price of the equipment.

We, therefore, turn to high-production machine-tool equipment, such as bar and chucking automatics, contour lathes, and plunge grinders, even though the size of our lots is much smaller than usually regarded as necessary to take advantage of high-production equipment. Here we will show a series of case histories of this type collected as they happened to come off the various machines, under these headings:

1 . . From turret lathe to single-spindle automatic chucker
2 . . From turret lathe to multiple-spindle automatic bar machine

CASE 1 . . . Single-spindle automatic chucker

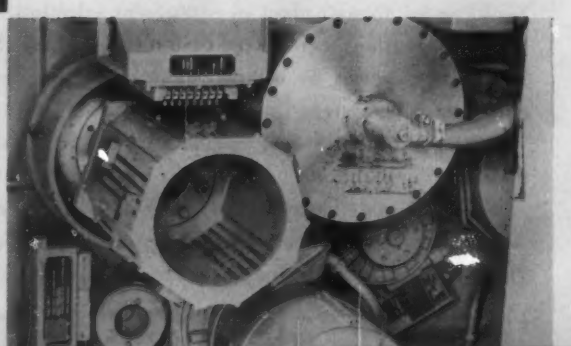


Average size of the lots in this case ran about 350 pieces (Table I). Average setup time was increased from 19.8 hr on the group to 23.5 hr, a rather surprisingly small increase. Over-all time, including setup, was reduced from 209.1 to 125.1 hr, a saving of 84.0 hr, or 40.2%. Production ratio of the automatic chucker to the turret lathe, including setup time, is 1.67. Limits on the automatic chucker are held on outside diameters to 0.002 to 0.003 in. Reaming is held to 0.001-in. tolerance.

The reason for the small additional setup time is because the setup for tooling on the pentagon, the cross slides, etc, is a good deal the same as on the turret lathe using, in general, the basic universal setup. Speeds, feeds, and cutting stroke are controlled by adjusting trip dogs on the pentagon drum, which actually takes only a bit longer than on the turret lathe (see closeup). The chucker gives the major advantage of controlled speeds and feeds, combined tooling and solidity for accuracy.

Investment cost of the automatic chucker today is $31,435. The corresponding investment in turret lathes for a production ratio of 1.67 is 1.67 times $19,360, or $32,360—practically the same.

Single-spindle chucker . . .
(W & S 2 AC) is versatile in applications. Details of 10 jobs in Table I indicate production times. Plastic guards have been removed to show detail of pentagon control drum



Pentagon control drum . . .
on the 2 AC is slotted, so trip dogs are adjusted to control feeds, speeds and cutting stroke. Any six feeds of 36 can be automatically applied

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consider high-production units...

3..From one-spindle automatic to multiple-spindle automatic bar machine
3A..From five-spindle to six-spindle automatic
4..From standard 6-in. grinders to 6-in. plunge grinders with 4-in. wheel face
5..From turret lathe to copy lathe
6..The purchase of a Bore-Matic primarily for quality
7..Light-equipment purchases pay out easily

Individual illustrations will show actual lot sizes, setup time under the new and old methods, actual over-all time in relation to the increased investment. To suggest a wider application of the principles employed for the benefit of other shops, we recompute, in several cases, the savings in realistic fashion for still smaller lots. The illustration of the Heald Bore-Matic is added to show the advantage of high-production equipment from the quality angle, even though cost savings are not particularly impressive.

In general, the facts presented show that setup time is always higher on the high-production machine, but not as high as we had originally expected. Production is, of course, much higher on the new machines, and over-all times, including setup, are much less. Various points about relative investment are shown on the basis of today's prices to give comparable facts and figures. The illustrations specify required limits actually held, so you can compare each type of example with your own conditions. Basic equipment policies involved are identified in each illustration, and the article concludes with a general summary of the various equipment problems involved in practical day-to-day operation of a small-lot shop.

replaces a turret lathe

PRODUCTION RATIO 1.67:1
LABOR SAVING $6271/Year

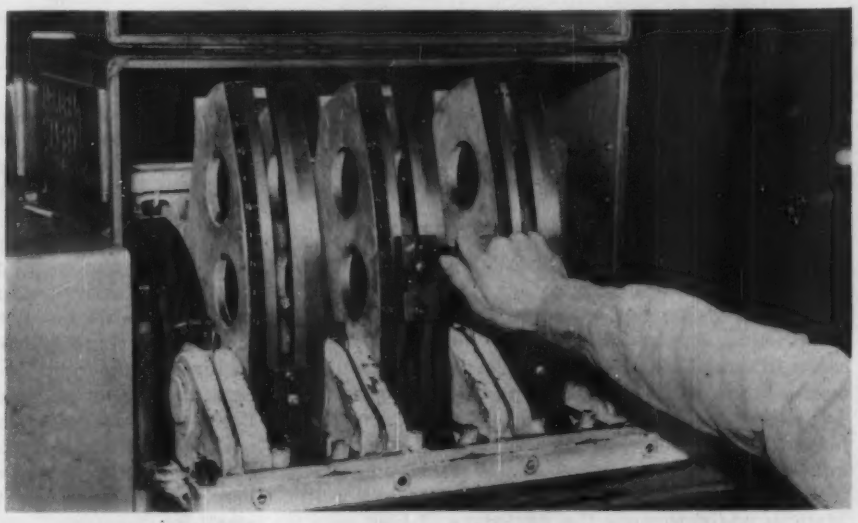
Labor cost of operating the new machine is two men for the two shifts times $4,680 a year (40 hr X 52 weeks X $2.25, equals $4680) or $9360 per year. To operate the corresponding turret lathes needed to get the work out, the labor cost is $1.67 X two men X $4680 X two shifts, or $15,631—an annual saving of $6271 with about the same investment.

Average size of lots on this machine, as shown by the table, was 350 pieces, although we often use this machine on much smaller lots. There are available some rather complicated formulas for determining the so-called "breakeven point" between automatic operation and turret-lathe operation, but we prefer to just sit down and figure it out thus: Let's assume we are going to reduce the lots to one-third this figure, or 116 pieces. Total over-all time for the larger lot was 209.1 hr on the turret lathe. Deduct the setup time, leaving 189.3 hr. We assume that to produce a lot a third the size will take 40% of the time, so multiply this by 40%, giving 75.7 hr. Add back in the setup time of 19.8 hr, and production time on the turret lathe for the smaller lot will be 95.5 hr, including setup.

On the automatic chucker, the over-all running time is 125.1 hr. Deduct 23.5 for setup, leaving 101.6. Multiply this by 40%, giving 40.6 hr. Add the setup time (23.5) back in, to bring the total to 64.1 hr. It is interesting to note that while the average saving on the larger lot was 40.2%, on lots of a third of this size, the saving is still 33.0%. If the computation is brought down to lots of 58 pieces, the over-all time on the turret lathe becomes 61.4 hr; on the automatic 45.8 hr, with a saving of 26%. As the over-all production ratio drops to 1.34, the relative investment required for turret lathes to do the same work will be $25,942, compared to the price of the automatic chucker of $31,435—or an additional investment required of $5493. Annual labor savings will be $3182. Investment figures, of course, are not as satisfactory as in the larger lots, but these figures show that smaller lots can be mixed in with somewhat larger lots to advantage.

TABLE I.. TURRET LATHE VS SINGLE-SPINDLE AUTOMATIC CHUCKER

				TURRET LATHE			AUTOMATIC CHECKER				
PART NUMBER	OPER NO.	AV LOT SIZE	PART NAME	PIECES PER HOUR	SET UP TIME, HOURS	TOTAL TIME PER LOT, HOURS	PIECES PER HOUR	SET UP TIME, HOURS	TOTAL TIME PER LOT, HOURS	SAVING, HOURS	HOURS SAVING %
808-1	1	100	Powerplus Cylinder	18.2	1.5	7	34.6	2.5	5.4	1.6	23
809-1008	2	300	Powerplus Rotor	22.2	2.0	15.5	28.4	2.5	12.5	3.0	19
827-4	1	400	Rear Head	21.3	2.0	20.7	50.0	3.0	11.0	9.7	47
827-4	5	400	Rear Head	22.7	2.5	20.1	42.1	3.0	12.5	7.6	38
1120-1001	1	300	Cyl. Housing	27.0	2.5	13.6	32.8	2.5	11.6	2.0	14
870-5	1	400	Rear Housing	9.0	2.0	46.5	20.3	3.0	22.7	23.8	51
870-5	2	400	Rear Housing	40.0	1.0	11.0	88.2	1.0	5.5	5.5	50
1126-9	1	500	Lower End Plate	11.0	2.5	46.0	18.3	2.5	29.8	18.2	38
2680G-58	3	50	Fan Housing	26.2	1.8	3.7	65.7	2.0	2.8	0.9	24
51-140	2	500	Liner	23.8	2.0	23.0	50.8	1.5	11.3	11.7	51
TOTAL				221.4	19.8	209.1	431.2	23.5	125.1	84.0	40.2



Slotting lugs . . . on W & S, 2¼-in., 5-spindle bar automatic are adjusted by loosening Allen setscrews. Here length of travel of horizontal-tool movement on the turret is being changed

CASE 2 . . .

Multi-spindle bar automatic replaces universal turret lathes

PRODUCTION RATIO 2.48:1. LABOR SAVING $13,853/Year

Table II shows jobs previously done on either #3 or #5 universal turret lathe. Average size of lot is 300. The over-all reduction in time is from 235.0 to 94.5 hr, a saving of 140.5 hr, or 60%. Setup time on turret lathes for these jobs totals 23.7 hr—on the automatic 46.0 hr. Limits on the five-spindle bar automatic on outside diameters are held to a total tolerance of 0.002 in. Production ratio of the five-spindle automatic and the turret lathe, including setup time, is 2.48. If we had larger lots, this ratio, we think, would increase to 3.0.

Here setup time is much higher, but is comparatively low compared to many "automatic" setup times because the machine has no cam changes. Setup is confined to adjustable linkage blocks on the permanent cam which is set to control the feed stroke of the pentagon and cross slides as shown in one closeup. The production advantage, of course, comes from the operation of five spindles continuously at high speeds, dropping off a finished piece for each indexing.

Investment cost of the machine happened to work out at exactly $40,000. To do this work on #3 and #5 turret lathes requires $38,886—practically the same amount of investment.

The labor cost of running the automatic two shifts figured as before is $9360. The labor cost of the equivalent turret lathes, two shifts, is $23,213—an annual saving of $13,853.

When figuring equipment purchases at a time when

TABLE II . . TURRET LATHE VS MULTIPLE-SPINDLE 2¼-IN. AUTOMATIC

PART NUMBER	OPER NO.	AV LOT SIZE	PART NAME	TURRET LATHE: PIECES PER HOUR	TURRET LATHE: SET UP TIME, HOURS	TURRET LATHE: TOTAL TIME PER LOT, HOURS	FIVE-SPINDLE AUTOMATIC: PIECES PER HOUR	FIVE-SPINDLE AUTOMATIC: SET UP TIME, HOURS	FIVE-SPINDLE AUTOMATIC: TOTAL TIME PER LOT, HOURS	SAVING, HOURS	HOURS SAVING %
VS-118A	1	300	Packing Retainer Ring	29.4	2.0	12.2	82.0	3.0	6.7	5.5	45
6680G-120	1	200	Casing Nut	14.6	2.0	15.7	37.3	3.0	8.4	7.3	47
1122-1015	1	500	Spindle Blank	16.2	3.0	33.8	44.1	4.0	15.3	18.5	55
9017-1002	1	1000	(Female) Strainer	48.3	1.8	22.5	107.0	4.0	13.4	9.1	40
1086-1013	1	200	Handle Cap	27.0	1.5	8.9	54.5	4.0	7.7	1.2	14
6680VS-112	1	300	Gear Housing Insert	20.3	1.8	16.6	45.2	4.0	10.7	5.9	35
1099-1002	1	200	Rotor	33.3	1.0	7.0	50.8	4.0	6.5	.5	7
1086-1149	1	100	Cone Wheel Adapter	17.1	2.0	7.9	103.0	4.0	5.0	2.9	37
1154-1125	1	200	Bit Bushing	42.0	2.0	6.8	306.0	4.0	4.7	2.1	31
1084-1018	1	200	Packing Cap	10.6	3.0	21.9	62.0	4.0	7.2	14.7	67
9016-1007	1	100	Valve Sleeve	19.6	1.8	6.9	326.0	4.0	4.3	2.6	38
791-1197	1	300	W. Collar	4.1	1.8	74.8	66.0	4.0	4.6	70.2	88
TOTAL				282.5	23.7	235.0	915.8	46.0	94.5	140.5	60

additional production is badly needed, we prefer to use the relative cost of completely new machines to get away from comparison of the cost of new machines with old equipment bought at various prices and with various depreciation rates. Eventually, of course, the old machines have to be replaced. To explain for factory executives who prefer to work on the established time-to-repay basis, that is, the time it will take the new equipment to pay for itself, we analyze this situation thus:

TIME TO REPAY

Cost of the new automatic is $40,000. Actual second-hand value of a six-year-old #5 universal and 1½ ten-year-old turret lathes, total $19,620, making additional investment $20,380. For two-shift operation: Dividing this by the labor savings ($13,853) gives a time to repay for two shifts of 1.47 years. For one shift, the time to repay will be 2.94 years.

We are inclined to think that requiring factory executives to justify the purchase of new equipment on a time-to-repay basis is not quite fair under present conditions. A machine tool purchased, for example, seven years ago, and depreciated on a ten-year basis, will have a depreciated value of 30% of the original purchase price. The accrued depreciation will not, of course, purchase a new machine which is much higher in price—probably 2½ times. This loss is caused by the difference between value and the price of the new machine. It is actually a loss against the state profit of the business as a result of inflation. Requiring factory executive to justify such purchases, including picking up the loss, is not realistic, because the entire loss must eventually be picked up anyway.

SECOND-HAND VALUES UP

Again, the second-hand value of the old machine will be found to be surprisingly high, in many cases equal to the original new purchase price, which helps the situation. We feel it is best to get rid of these older machines to take advantage of present second-hand prices, because if they are left in the shop, they take up space, cost a certain amount of overhead, and actually will not be used very much.

When figuring as before, if the size of the lot is cut in half to 150 pieces, we assume it will take 55% of the running time to do 50% of the work. Following the previous approach, the savings on lots of 150 pieces is 48%, as compared to 60% on the larger lots. The investment has increased in the amount of $9,424.

We use one operator for each automatic, although theoretically one operator should be able to take care of two automatics on the basis of the setup time in the table. Practically, however, for these small lots which require a relatively high ratio of setup time to running time, the varying range of setup times, the varying length of machine-tool hours, the necessity for keeping a constant check on the fast rate of production makes this practically impossible. We are now running six operators, two shifts, on three bar automatics. If we get to four bar automatics, we may be able to handle them with three operators per shift. As other companies find it feasible to run two chuckers per man, we expect to reduce the present ratio of men to chuckers too.

CASE 3 . . . 5-spindle automatic replaces single-spindle

PRODUCTION RATIO 2.52:1. LABOR SAVING $14,000/Year

The twelve jobs in this case are not shown in detail because of lack of space. To summarize: Because the work was transferred from a single-spindle automatic, average size of the lot ran up to 733 pieces. Setup time on the single-spindle totalled 37.0 hr; on the five spindle, 45.0 hr—a small increase. Over-all time on the single-spindle was 376 hr, including setup; on the five-spindle, 149.0 hr, a saving of 227.0, or 60%.

Advantages of five-spindle operation are obvious, although we regard the one-spindle machine as very efficient. If we had larger lots, we could possibly take advantage of more-efficient setups on the old machine. But we are constantly improving times on the five-spindle automatic with more experience.

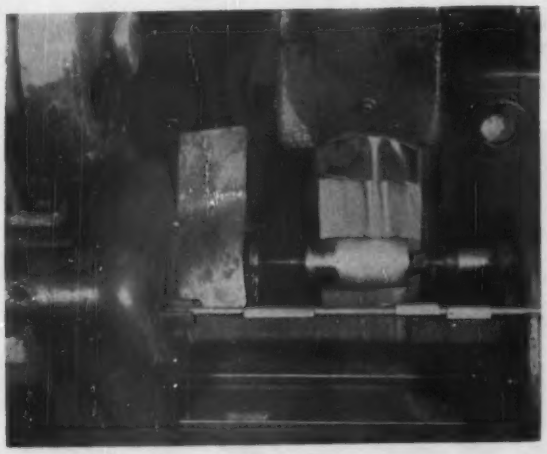
Investment cost of the five-spindle automatic we have figured as before with complete equipment at $40,000, although all of this is perhaps not needed for the jobs studied here. The production ratio of the five-spindle to the single-spindle, including setup time, is 2.52. This would require 2½ of the single-spindle machines at $11,250, or $28,125, an additional investment of $11,875. Labor savings alone figure $14,040 per year.

We feel that both the bar and chucking automatics are somewhat versatile in their applications and while, in our case, we have had plenty of work to keep them busy two shifts, the ability of the automatics to take various sizes of lots and various types of work has increased their field of application in our shop.

CASE 3A . . . Six-spindle replaces five-spindle automatic

PRODUCTION RATIO 1.77:1

We have purchased a 1¼-in. six-spindle automatic, which gives us higher speeds and six stations. While we have had some rather interesting improvements in time on certain jobs as compared to the five-spindle, we really are not yet prepared to make any accurate over-all statements on the increased production savings. It appears that the machine has versatility to do a great variety of the work at least as well as the five-spindle, plus much faster times on smaller parts. It appears that double setups will give further advantages on some part of the work. Certainly, this machine duplicates the general savings found in the 2¼-in. multiple-spindle bar automatics in the previous studies. Machine tools with the production ratio of 1.77, such as this example, also speed up the production process in the plant and, naturally, reduce the size of the inventory in process.



Landis 6-in. external grinder . . .
has 4-in.-face grinding wheel slightly wider than the work, so wheel can be oscillated slightly. Cutting-fluid supply was reduced so the picture would show the wheel

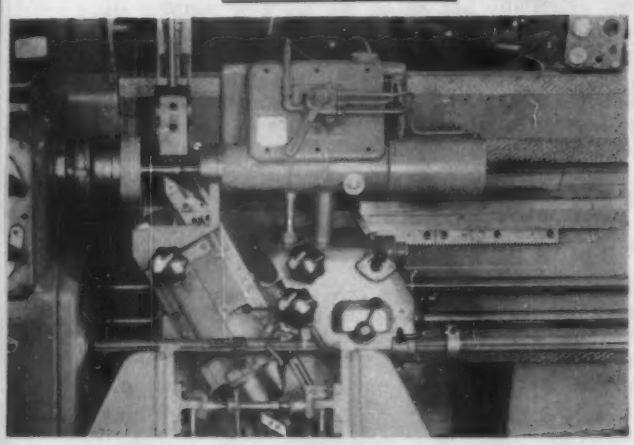
CASE 4 . . .

Plunge grinding with

This group of eleven jobs, time studied as they came off the machine, were originally done on a standard external grinder which requires the wheel to traverse the work along the job. Average size of lots is 222. The job was changed to a standard 6-in. grinder modified by addition of a spindle to take a wheel with a 4-in. face and proper guard. Final dimensions are held to 0.0003-in. tolerance. Production ratio of the new grinder to the former external grinder, including setup time, is 2.25. Setup time was increased from 3.7 hr for the eleven jobs to 6.0 hr because of the necessity for careful trueing of the wheel to avoid taper. Over-all time, however, dropped from 92.4 hr to 41.0 hr, a saving of 51.4 hr, or 56%.

CASE 5 . . .

Copy lathe, with cut-off and centering,



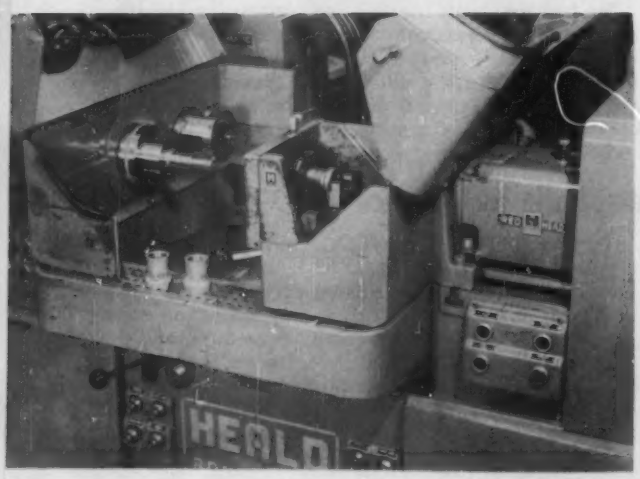
In this view . . .
of a New Britain GF copy lathe, tool is just away from the piece. Prototype is at bottom center, held by dog

Nine different jobs average 144 pieces. Former setup time, usually on turret lathe, was 23.1 hr, on the copy lathe, only 10.0 hr because setup is very simple. Sample pieces, "prototypes," or round templets are required for each job. Over-all time for the group of pieces was reduced from 73.0 hr to 41.2 hr, a saving of 31.8 hr, or 44%. The majority of the work is a great variety of spindles completed to the point of heat treating, then ground. Production ration of the group of machines to the old method, including setup time, is 1.77. On the copy lathe, limits are held to a total tolerance of 0.003 in.

In reprocessing these jobs, we first cut off the bar

CASE 6 . . .

Bore-Matic



Boring wheel-end handle . . .
is shown in this setup on the Heald Bore-Matic Model 222. This machine has improved quality, reduced assembly time and given better product performance

To illustrate our basic equipment policies, we include here an example of equipment purchasing which is, perhaps, not entirely to our credit, but which illustrates the practical difficulty sometimes experienced in buying equipment. Several years ago, we took the machining of bores from turret lathes to a Heald Bore-Matic double-spindle with automatic cross-slide with index for eccentric bores. This machine is primarily a finish-boring machine which puts the bores exactly where we want them. It holds limits of 0.001 to 0.0005 in., and bores are exactly round.

This is a high-production machine tool designed for

4-in. wheel replaces standard 6-in. grinder

PRODUCTION RATIO 2.25:1

While there is nothing particularly novel about 4-in. plunge grinding, a 4-in.-wide wheel utilizes the full width of the wheel in a plunge operation, avoiding traversing. This is a good illustration of equipment policy in carefully selecting just the right machine for the job. In this case, change had been under consideration for quite a while, but we did not have sufficient work to keep the machine busy. Then a change in basic design occurred which increased possible work load to the practical point. Lot size is unimportant, because setup time is very low on an external grinder.

At the present time, this is a one-shift operation, but the machine will be run occasionally on the second shift from now on. Investment cost of the external grinder modified with extra guard and spindle was an additional $105. The extra cost of the 4-in.-face wheel compared to the 2-in.-face wheel is $28, although metal removal per ounce of wheel loss is undoubtedly higher. Annual labor savings are $5850 for one shift, in return for a negligible additional investment of $133.

Several years ago we increased grinding standards substantially. The efficiency rate fell off slightly, but the net gain was good. We are having difficulty finding much opportunity for reducing cost further, because it appears that automatic devices for loading and the like are hardly practical on the variety of work in our small lots, and it appears that any further step-up of output rate might well affect quality.

replaces various methods

PRODUCTION RATIO 1.77:1 LABOR SAVINGS $3604/Year

at the cut-off machine, center the piece, then put it on the G F copy lathe. The group of three machines cost $32,680. Machines formerly required to do the work cost $26,647, an increase in investment of $6033. Annual labor savings, on the basis of one shift, work out to $3604.

While, in general, we prefer to purchase new equipment on the basis of two-shift savings, we feel that the financial facts warrant the purchase of this group on the basis of one shift, with additional advantages in the way of controlling the rate of production and certain quality realized.

As is sometimes the case, in setting up this machine and getting it going, we had to reprocess quite a number of spindle drawings, change the drawing references, tool references, etc, so it is probable that estimated savings were not realized for the first four or five months. We had in mind the practical situation represented by the comment of factory executives that "it is easier to hire one operator for the contour machine than to hire a couple of good turret-lathe operators." We also had in mind that savings are figured at today's labor rates and today's machine cost, and with the built-in inflation now evident in the wage structure, these savings per hour in dollars will undoubtedly go up over the next three or four years. We also expect more than one-shift operation as we find all the work that can possibly go on the machine.

Basically, the savings will pay for the additional investment in less than two years, which is satisfactory, but it is probable that the indefinite advantages in future savings will be double the rate of present savings. Machine tools with a production ratio of 1.77, such as this example, also speed up the production hours in a given plant, and inevitably reduce the inventory in process.

improves quality

PRODUCTION RATIO 1.20:1

long runs with individual fixtures. As we attempted to use this machine for short runs on a wide variety of work, we required a universal type of fixture in which various adapters are mounted for the different types of work. This, in turn, naturally increases the problems of concentricity. For example, alignment of two bores must be held to a total indicator reading of 0.001 to 0.002 in. Our own process engineers added fixtures for this alignment type of work, did not do a very good job, and did not get very accurate location.

First checkup on results showed good time savings on the simpler jobs on fixtures supplied by the machine-tool manufacturer, but the alignment jobs showed no savings, sometimes an actual increase in time. This situation is now pretty nearly corrected, so that on the over-all picture the machine is now showing modest savings of 10 to 20%. This is hardly enough to justify the price of the machine, plus the fixtures that cost more than the machine itself. Certainly, on a facts-and-figures basis, investment is not justified.

However, the major advantage of the machine is improvement in quality of the finished product. Under the old methods, we had constant trouble with distortion of metal from clamping and improper locating. Savings in inspection and assembly time from the change are tangible, but hard to evaluate. Average piece on the Bore-Matic requires one or two minutes. The assembly of portable tools involves from 30 min to 2½ hr and probably involves, say, five pieces which have been through the Bore-Matic that are exactly right.

We think this situation is well shown in the case of Navy bronze air-valve casings with two holes in line, with 0.6875-in. hole with three air slots in one side, involving an interrupted cut. Former total time for

this job, including hand reaming in assembly, totalled 6.2 minutes, occasionally running much higher because of difficulty in keeping the reamer sharp on this material with interrupted cut. On the Bore-Matic, the time was 2.5 minutes, a saving in production, plus assembly, time of 60%. Regardless of any savings, the real improvement is in the quality of the finished job because the valves are tight when first assembled and will not leak for a long time. This was a bother to the customer.

This is a case in which factory executives were not able to present their case very well at the time of purchase, but analysis of assembly operations two years later shows reduced assembly times which fully justify the investment.

Curiously enough, the same situation often arises with our own customers who sometimes feel convinced that certain portable-tool equipment would cut their costs, but do not know how to prove what the tools will do. Along with the custom of the industry, we put the portable tools on trial, give the customer figures, then make sure he doesn't exaggerate the figures. There seems to be a tendency on the part of foremen and supervisors who are largely instrumental in buying light equipment to figure that if the equipment saves 30% it saves 30% *of the man's full week*, times so many dollars per hour. Usually, however, the equipment is only in use 40 or 50% of the time, and the figures should be straightened out on what we call a time-to-repay basis. This is valid, and the more-conservative and reasonable approach will get requisitions approved.

CASE 7 . . . Light-equipment purchases pay out easily

PRODUCTION RATIO 1.20:1

Another situation in which we buy without exact reference to savings and investment is in the light-equipment or accessory field—such items as air gages, hand-lift trucks, small arbor presses, etc. In the past, we subjected all these items to definite detailed analysis of savings in relation to cost. We have discoverd that, in a general way, any of these items which cost $1000 or less, which do the job, show some savings of 10 or 20%, or without saving show some quality improvement, hence always work out. Now we have short-cut this process and given the factory executives authority to buy all such material with only one reservation—that they must be sure they examine competitive makes and get the best item for the job in relation to cost.

General equipment problems and policies

Thus far, we have discussed our attempts to match the greater increases in cost of labor and equipment with the smaller increases in the selling price of our products. We have given examples of putting small-lot production on various large-lot machines; we have shown one example of selecting the right machine for the job (the 4-in. plunge grinder); we have shown an example of purchase for improvement of product quality, the Bore-Matic.

Here we will explain our general policies and problems in the equipment field, including the organization of personnel for equipment selection, policies in the repair of equipment, and policies in the coordination of equipment policy with the five-year growth plan.

MANUFACTURING COMMITTEE

The Manufacturing Committee is responsible for equipment. This consists of the works manager, assistant works manager, superintendent, assistant superintendent, and production control manager. This group is, first of all, responsible for constant checking of present equipment, as well as for providing additional equipment for added production.

THE TREND: MORE SMALL LOTS

We feel that improvement of shop methods is a continuous process which is never finished, and takes a lot of time. The Committee is instructed to analyze the entire situation on the basis that the small-lot phase of the production problem here is going to get worse, not better, because our product will be made in smaller lots. (The portable tools which we make sell because the user can take the tool to the job, rather than bring the job to the machine. As a result of the increasing diversification of Metalworking in the last five to eight years, there has been considerable modification and diversification of basic portable tools: adding different speeds, different front handles, different rear handles, etc. This makes our small-lot production problem worse, but the customer feels that the great variety of tools enables him to select just

the right tool for his job, and thus to obtain maximum savings.)

The Committee is also instructed to use the purchasing agent for information, and the facilities of production control and design to ferret out all the facts. Machine-tool salesmen, we find, are prone to emphasize some particular feature of their product, such as automatic cycling. We need to know *all* features.

The Committee is responsible to find out how wide an application these features have in our own shop, now and later. We find that estimates of production time presented by the suppliers are fairly close on the whole because they are based on 80% efficiency, but sometimes recommendations do not work. For example, on the copy lathe, a steadyrest was recommended for long spindles, but it did not work. We changed to an air cylinder and collets for more rigidity to eliminate chatter.

LONG-TERM APPEARANCE IMPROVEMENTS

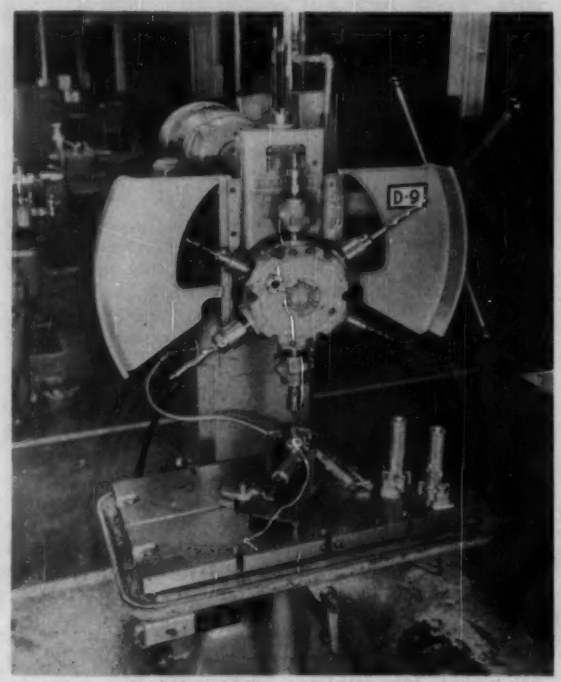
The Committee is also instructed to add equipment for improving the outside appearance of the product. All of our castings—magnesium, aluminum or malleable iron—are polished on the outside for appearance. The majority of the internal parts (after heat treating and grinding) have sharp corners broken, etc. Theoretically, this outside finishing does not affect performance of the basic tool, and, of course, it raises our manufacturing costs. Customers tell us, however, they feel that if we pay a good deal of attention to the outside of our tools, we are probably spending at least the proper amount of attention to the inside as well. Further, they like the improved finish. This, however, requires us to have additional equipment.

To keep this committee alert, we send a whole group to machine-tool and tool shows, to other plants, and invite salesmen of our regular suppliers to investigate regularly the performance of their products in our plant. New equipment or devices are first considered by the purchasing agent for screening, then passed on for preliminary examination to the day superintendent. Reports on this activity are required quarterly.

TIME-TO-REPAY STATEMENT

In the case of machine tools, the Management Committee asks for preparation of a "time-to-repay" statement by the Manufacturing Committee under normal operating conditions, as discussed in one of the preceding case studies. This has been our standard approach for many years. Under present conditions of increasing production, we now ask for a comparison of the cost of the various kinds of new equipment required to get production under different methods, as outlined in this article. The Management Committee always insists on definite information about the factor of use of the proposed equipment, based on extensive analysis of the work to be done. We expect the Committee to select the right tool for the job—to select the best machine tool available competitively.

Management does not attempt to force factory executives to justify increased investment required because of the inflation of machine-tool prices. Eventually, we must replace the equipment anyhow at the increased price. We do not attempt to include so-called "fringe" benefits in our savings figures either, although we recognize that doing so would increase the labor savings at least 15%. We prefer to keep cost comparisons which will be studied by a good many people just as simple as possible.



Double setup for drilling . . .
counterboring and tapping a straight handle (right) on a 2A Burgmaster

WHEN SHOULD A MACHINE BE REPAIRED?

The broad, general objective of the Manufacturing Committee is to keep manufacturing costs in line with selling prices of our product in spite of greatly increased labor costs and equipment prices. In seeking this objective, the problem of when to replace does not prove puzzling when the new equipment will cut costs, but the question of repair sometimes is a problem. For example, our policy is to run turret lathes two shifts for five to seven years under ordinary maintenance, then send them out and have the ways scraped, hex turret rebored, worn parts replaced, etc. This would give another two or three years of use and maybe an additional year or two on second-operation jobs.

The Manufacturing Committee now questions this policy, because the resale price of used machines, at the present time, is surprisingly high. Examination of our equipment ledger shows that the actual secondhand resale price obtained for most machines, seven to eleven years old, is within a few percent of their original cost. For example, a #5 universal turret lathe purchased in 1945 cost $5695. This machine was kept somewhat longer than usual, awaiting development of a new and improved design, and was replaced by a new #5 universal at a price early in 1956 of $15,509. The old machine, however, was sold in the secondhand market for $5500, a depreciation of only $195 in almost

eleven years! (We are informed by local secondhand dealers that six-year-old #5 universals now sell on the market for $11,000, which is exactly 2.85 times the secondhand price eleven years ago. If factory executives are required to justify equipment purchases on a time-to-repay basis, they are entitled to use the price of the present machine, less the secondhand-machine realization, to determine what they have to repay in a given period of time—not the price of the new machine less the undepreciated balance. Application of this approach to concrete cases shows many valid proposals for replacement might be killed off by what we regard as the improper approach.

The Manufacturing Committee is also responsible for providing the proper space for equipment and a good setting. The plant is light, the factory is air conditioned (which holds the temperature between 75 to 76 F all the year round, with a humidity of less than 50%). This constant temperature keeps work and gages uniform; while we have never been able to prove the percentage saving of production as a result of general working conditions, such as air conditioning, we are quite sure that better conditions certainly justify the cost of air conditioning which we figured several years ago to run about 3¢ per hour for each worker for five summer months.*

FIVE CURRENT PROJECTS

At the present time, the Committee has several equipment investigations underway. For example, thread grinding with a crushed wheel appears to be very slow to us. We are considering changing the drawing of the metal and using a Cridan thread cutter providing we have enough work—knowing that this machine will also handle internal threads with Class 3 fits.

Another project is in the drillpress area. Several years ago, we installed a small Burgmaster which applies the hexagonal-turret principle of combination drilling, counterboring, tapping and spot facing. This shows substantial savings in time on the light work (approximately 57%), and the investment is very low compared to that for machines formerly used (about one-third) either 4-spindle drillpresses or turret lathes. In examining this situation, we were somewhat surprised to find that the savings are spotty, varying from a minimum of 2% to a maximum of 73%. This suggests better scheduling of individual jobs to this type of machine.

Unfortunately, as we tried to apply this machine to heavier work, the slides appeared somewhat weak, but there is now an improved model available which has an automatic cycle and is much sturdier. The Committee is now finding out the exact load factor (because in practice, the machine is used part time during both shifts), the exact net cost of replacement of the original machine, and the cost of adding one new larger model.

This again illustrates another situation we often find. Sometimes the new machines we want are not available when we want them, and really there are a good many of the standard machine tools that haven't been thoroughly revised for a long time.

The Committee is also considering special drill equipment to drill horizontally in gang fashion. The Milling Department is studying further application of automatic cycling with double fixtures, etc. Even the Maintenance Department is being studied with the hope that various items of light equipment will have sufficient use to justify themselves, because of a 50% plant addition which is just being completed. Such items of equipment are usually relatively low in purchase price and are often justified with only modest savings and only a modest factor of use.

FIVE-YEAR PLAN

The Rotor Tool Company operates under a rather thorough Five-Year-Growth Development Plan, which endeavors to find solid reasons for growth, to develop definite plans to realize this growth and to put these plans in such practical form that individual programs can be assigned to various divisions for the following two years.

In connection with equipment, we have found that it is quite necessary to break down this five-year-growth plan in detail so that this can be done, eliminating generalities. We are now planning production requirements by type of product for the benefit of men of the Manufacturing Committee so they can estimate needs more closely. Different types of portable tools create different proportions of machine-tool loads on turret lathes, milling machines, etc. In practice, Committee study of this situation shows that future machine-tool requirements will go in a series of steps to match up with varying production schedules. Some of the steps are small, some large, in a given year. We have also determined the point at which we need more space beyond the addition to the present plant, and are trying to level off the varying step programs with the varying replacement programs to avoid peaks in certain years. The Committee has not yet solved the problem of what to do when production requirements need half a machine, that is: Do we buy machines for less than one-shift operation, or do we subcontract this work until the load factor increases?

Estimating of future requirements is handicapped by increasing difficulties in this area in keeping a second shift adequately staffed. We have found that taking the Committee into our confidence does help in outlining future manufacturing programs and does, in some cases, affect selection of equipment for today's needs.

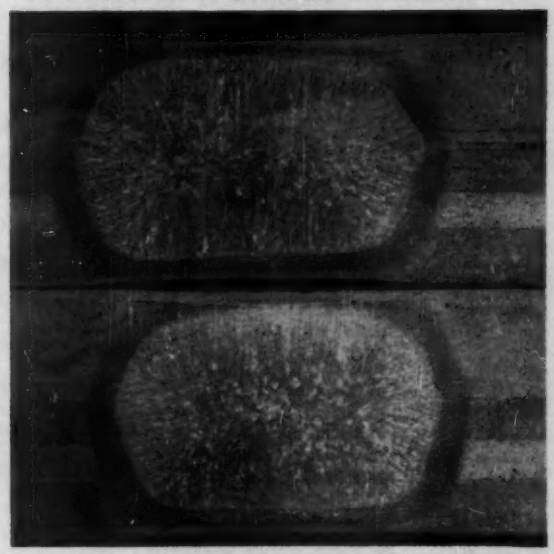
SUMMARIZING:

To summarize our approach to equipment policy: We are quite certain the broad constructive approach, looking to the future has in the past cut costs and will in the future.

We feel in this area it is a function of the management committees of metalworking firms to provide the proper climate for the study of equipment purchases and to keep shop equipment up to the practical limit of efficiency. We feel this can be done in small companies as well as large, under small-lot conditions as well as quantity-lot conditions. We know that constant emphasis on quality in the selection of equipment will improve the quality of the finished product.

The clinching fact is that manufacturing costs expressed as a percentage of selling price have been actually held in line with selling price since April 1, 1937, largely as a result of what we feel are sound, progressive, equipment policies.

* "American Machinist", February 2, 1938



Two typical spotwelds in previously brazed laminated material show resulting structures

Brazed stainless sandwich spotwelded

Honeycomb panels, assembled by brazing, can be spotwelded to supporting members. Structures and physical properties of welds compare favorably with those of welded sheet, are well within military specifications, and welding setups are similar to those for other stainless. Corrosion resistance of the steel is not affected by presence of the brazing alloy, according to tests here reported

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CONVAIR-FORT WORTH
a division of GENERAL DYNAMICS CORPORATION

FIRST . . . THE "WHY"

Supersonic aircraft with long-range performance demand high strength-weight ratios. Honeycomb sandwich is the answer—offering good strength and insulating properties, plus low weight. Common present types are glass-fiber or aluminum honeycomb, adhesive-bonded within aluminum skins. But, as speeds increase, skin temperatures and loadings increase, and a special type of honeycomb—stainless steel, brazed to stainless skins—is required.

Best material thus far is 17-7PH, which can be heat-treated and brazed at the same time, thus eliminating one furnace operation. Parts are assembled with an 85%-silver, 15%-manganese brazing alloy, heated to 1450 F in inert atmosphere to braze, cooled, refrigerated for transformation, then aged at 1050 F to produce the hardened condition.

Panel edges, made up of the two skins plus one or more stiffeners, brazed, and vapor-blasted to remove discoloration, have thus far been riveted to support members to produce assemblies. This increases weight and reduces surface smoothness, so spotwelding is preferable.

SECOND . . . THE RESULTS

Spotwelding as a means of fastening brazed, laminated, 17-7 PH stainless steel to support members has proved to be entirely feasible. One very attractive feature of the process is that no special equipment or techniques are required, and any well-equipped welding department with trained personnel can produce strong sound welds in 17-7 PH stainless in condition TH-1050 with setups very smiilar to those used for other stainless steels.

Some strength loss occurred in the heat-treated metal in the weld area, but strengths obtained were high enough so this was not considered detrimental. Welding was not performed prior to heat treatment because it was believed that growth of the steel resulting from heat treatment might have produced failure of the welds or distortions in the skins.

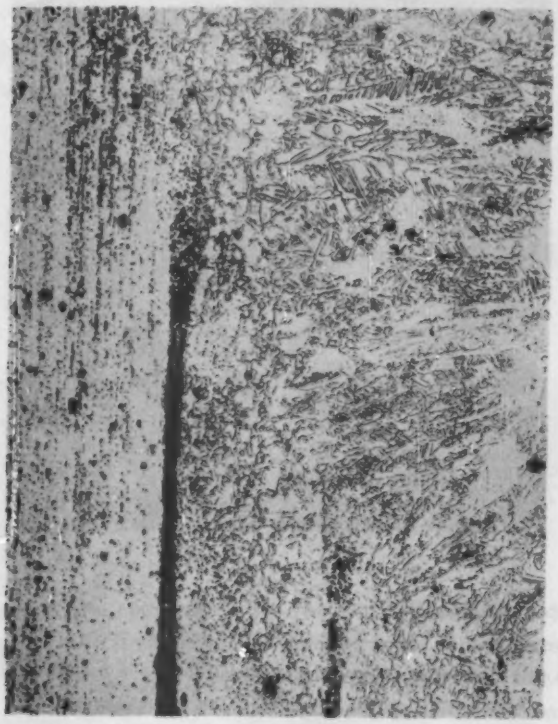
Comparison of results obtained on brazed and unbrazed test speciments of comparable thicknesses reveals no significant difference in physical properties, and the strengths of both types are well above the minimums listed in military specification MIL-W-6858. No detrimental effects of the silver-manganese brazing alloy on weld strengh or corrosion resistance were apparent.

WELDING METHOD

Spotwelding was conducted on a Sciaky, 3-phase, 100-kva press-type machine. Welding schedules

progressive, equipment policies.

Brazed stainless sandwich spotwelded . . .



Junction of brazing alloy and weld structure at 100X

Junction of brazing alloy and weld structure at 500X

were established in the same manner as for welding any hardened stainless steel. No particular difficulty was encountered in preparing welds, because the weldability of the brazed panel to sheet material was the same as that of welding plain sheets of stainless steel. Samples of plain sheets of 17-7 PH stainless steel were spotwelded to produce a combination of the same thickness as the spotwelds containing brazed specimens. This was necessary to have comparative samples for shear-strength, fatigue-strength and micro-metallurgical tests.

TEST SPECIMENS

Five groups of brazed strips were made up for the tests. Here are the laminate combinations, with letter designations used in subsequent data:

	Sheet Thickness, in.				*Total*
Combination	1	2	3	4	*Thickness, in.*
A	0.008	0.020	0.010	—	0.038
B	0.010	0.020	0.010	—	0.040
C	0.008	0.025	0.010	—	0.043
D	0.008	0.063	0.010	—	0.081
E	0.008	0.020	0.010	0.040	0.078

TEST RESULTS

Shear strengths . . . of 20 samples of each spotwelded combination were obtained with a Detroit bench-type tensile machine. All exceeded the requirements of MIL-W-6858. Comparison of shear strengths between brazed and unbrazed samples (Table I) indicates no appreciable difference.

Center sheets are a minimum of 0.020 in. thick, and total combinations are 0.038 in. or more. No comprehensive information has yet been accumulated on spotwelds using thinner laminates, but preliminary work indicates that erratic shear values are obtained, even though the macro-specimens are uniformly satisfactory.

Inspection of sheared specimens shows that shearing of the nugget occurs at different interfaces within the laminate. Therefore, in some cases, the whole laminate is involved in the shearing action and high values result; in other specimens only one or two of the laminate sheets enter into the loading, with failure occurring at the point where the top of the weld nugget coincides with the junction of two sheets. This problem was not encountered on the thicker laminates.

Fatigue tests . . . were made to determine the difference, if any, between the brazed sheet spotwelded to the unbrazed and comparable thicknesses of unbrazed spotwelded samples. Tests were made on Sonntag fatigue machines which operated at 1,000 cycles per minute at 10% and 50% of the average shear strength of each group of samples. Fatigue results show a wide variation in the number of cycles to failure. However, this was expected, because it is an accepted fact that spotwelds have poor fatigue characteristics. There was no advantage in either the brazed or unbrazed samples on the number of cycles to failure, so it was concluded that

Table I . . SHEAR STRENGTH COMPARISONS

Specimen	Static Shear, Avg*	Spec Min Avg	Fatigue Load, Lb** Max	Min	Avg Cycles to Failure	Remarks
B: 0.020	905	710	452.5	90.5	25,400	3 pc failed through hole of 0.020" strip
0.040, 0.020	1117	710	556.5	111.7	18,400	
B: 0.025	1307	970	653.5	130.7	20,400	
0.040, 0.025	1033	970	516.5	103.3	30,800	
B: 0.040	2162	2075	1081	216.2	2,800	
0.040, 0.040	2666	2075	1333	266.6	8,400	
B: 0.063	1800	1585	900	180	36,400	1 pc failed through hole of "B" strip after 18,000 cycles
0.040, 0.090	2663	2075	1333.5	266.3	29,200	4 pc failed through hole of 0.040" strip
B: 0.025, 0.040	1667	970	833.5	166.7	4,600	All pc failed in nugget between 0.025 & 0.040 strips
0.040, 0.025, 0.040	1508	970	754	150.8	62,000	
C: 0.040, 0.032	1670	1250	835	167	2,200	All pc failed in nugget between 0.040 & 0.032" strips
0.040, 0.040, 0.032	2233	1250	1116.5	223.3	18,200	
D: 0.032, 0.025	1429	970	714.5	142.9	19,200	
0.080, 0.032, 0.025	1492	970	746	149.2	17,800	All pc failed through hole of 0.025" strip
D: 0.032, 0.025, 0.040	1299	970	649.5	129.9	63,600	
0.080, 0.032 0.025, 0.040	2587	970	1293.5	258.7	6,200	All pc failed through hole of 0.032" strip

* Based on average of 20 shear specimens

** Tension load cycling between 10% and 50% of average static shear strength

brazing does not influence the fatigue strength.

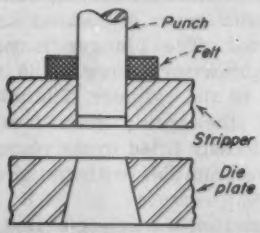
Macroscopic examination . . . of five samples was made for each combination spotwelded. Samples were examined under low magnification for cracks, porosity and amount of penetration. No detrimental defects were found at 3X.

Microscopic examination . . . of brazed spotweld cross-sections was made to determine the extent of alloying of the weld area by the silver manganese. Samples were prepared and etched electrolytically in a 10% solution of oxalic acid. At 500X, it can be seen that the silver-manganese begins to break up in the heat-affected zone, but it cannot be seen in the structure of the weld nugget. Manganese alloys readily with iron, and under the high temperature and pressure produced in making the spotweld, it is believed that the manganese enters the solid solution. As silver is not soluble in iron and forms a monotectic reaction with chromium, it appears that the silver is so finely dispersed it cannot be resolved at normal magnifications.

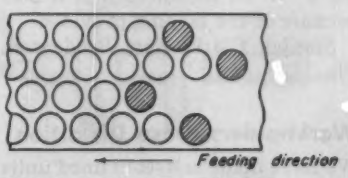
Corrosion-resistance . . .effects of brazing and the alloying of brazing material were determined by subjecting samples of the panel to a Strauss intergranular-corrosion susceptibility test. There was evidence of corrosion, but the corrosion was not restricted to the weld areas, and none was apparent at the brazed interface.

Diemaker's Kinks

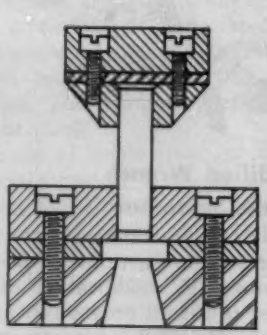
FEDERICO STRASSER



WHEN BLANKING aluminum, lubricate both the stock and the punch. Put a ring of felt around the punch just above the stripper plate and keep this ring saturated with oil. It will trickle down the punch and lubricate the cutting edge.

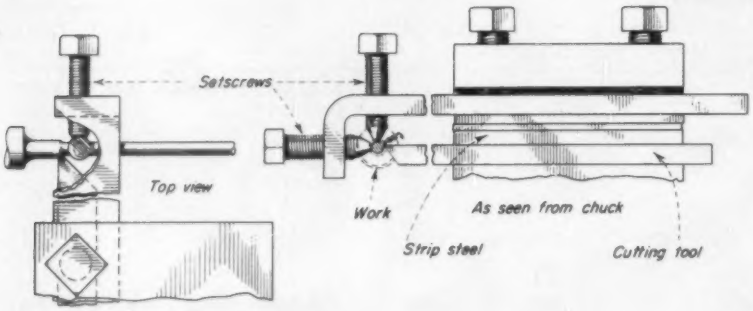


WHEN MULTIPLE blanking or piercing in thick stock, the holes that are cut simultaneously should be spaced at a distance at least equal to the hole diameter. This rule provides sufficient strength for the die plate, and it also avoids punch breakage from excessive side thrust from distortion of the strip.



SAFETY in die design seeks to avoid any chance that the operator's fingers can be hurt. When the die is equipped with a stationary stripper, bevel the punch-holder plate.

Practical Ideas . . .



Follower Rest Mounts on Toolpost

I was handed a few bars of copper to be made into test bars. They were 14 in. long with a dia of ⅝ in. The fly in the ointment was that they had to be turned down to 3/16 in. for a length of 12 in., and the smallest lathe available was a 12-in.-swing job.

The follower rest supplied with this machine did not come within 5 in. of the chuck holding the work. Since the parts were urgent I had to devise something in a hurry.

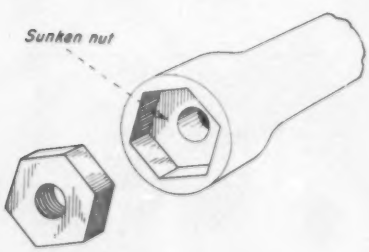
The solution, as it turned out, was quite simple. I cut off a length of 1 in. by 5/16-in. CRS, and bent one end 90°. Two holes were drilled and tapped for a pair of ⅜-in. setscrews at this end, one from the top, and one through the bent section.

The improvised follower rest was clamped in the toolholder in conjunction with the cutting tool and a proper amount of strip steel to center the back screw with the cutting edge. The follower should be so placed that the screws will touch the work immediately behind the tool.

With the screws backed off, and with the work resting on the tailstock center, a cut is started. The setscrews are then brought to bear on the work, finger tight. A cut of 1/16 in. and feed of 0.020 in. per revolution is possible without any apparent difficulty.

It is imperative that the tool be razor sharp and the work have ample supply of coolant throughout machining.

Thomas Gray, Belfast, Northern Ireland



Modified Wrench Works Smoother

A spinner wrench can be too deep when used to start nuts in machine assembly. A modification of the recess to permit only a full nut to be seated is a definite improvement.

Here's the way we altered our wrenches: We peened out the edges of a nut to swell it. Then it was driven into the socket of the wrench until it hit bottom. The thread was drilled out to provide clearance for the bolts, if any, going through the assembly nuts.

The remaining depth of the socket should be only deep enough for a full nut. This simplifies starting a nut on the threads of a bolt because of the landing provided.

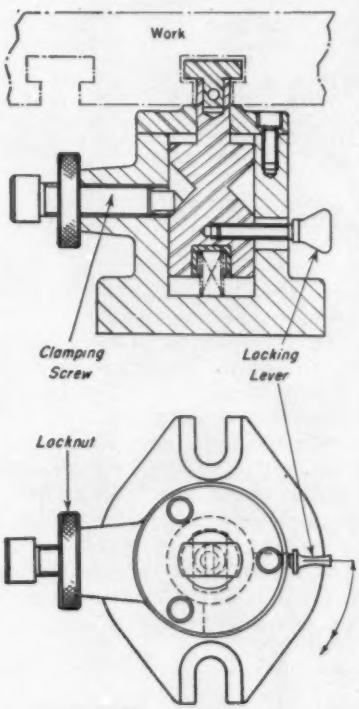
Stanley Clark, East Bradenton, Fla

Workholders Erase Distortion

We have made self-contained units for a three-point clamping arrangement to permit final machining of machine-tool tables and similar components. The units were designed to erase the distortions created by the roughing operations.

Clamping action is applied to the T-slots in the workpiece at three chosen points. This is done after the units have been located on the machine table or a common plate. The locking keys are set in neutral positions and the workpiece is placed on top of the units. The locking keys are then engaged by rotating the lever 90°.

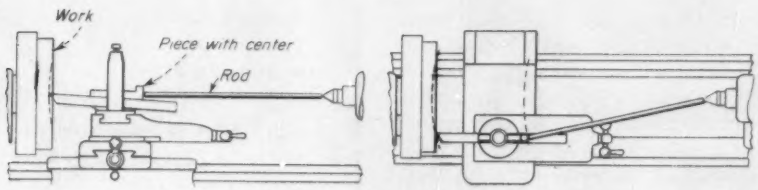
Clamping force is applied by tightening the clamping screw as far as it will go. The locknut is then tightened to prevent the locking screw from loosening because of vibration. A taper pin



through the top portion of the plunger permits interchangeability with other types of locking keys if desired. The plunger is preloaded by a spring resting in the bottom of the cylinder. The other end of the spring goes into a sleeve loosely fitted to the plunger to allow rotation without spring bias.

A distorted workpiece nested on three neutral points was machined to within an error of flatness of 0.0002 in. After perfect linearity has been established on one side, subsequent machining is easy.

John Horan, Croydon, Surrey, England



Rod Aids in Turning Large Radius

We had a considerable number of sizeable parts to machine. One of the operations was to turn shallow radii on the faces of each part. This would indicate a cam had to be made, including its mounting brackets and follower. Fixtures of any kind add an extra expense to a job which many times is difficult to carry. Our case was no exception.

The method we devised proved highly successful, as well as inexpensive. The only expense added was that of a steel rod whose length determines the radius cut.

With the work set up on a faceplate, or in a chuck, the tool and a piece of steel with a center is mounted in the toolpost. The tailstock center is used to check the center of the piece of steel in the toolpost. When these points check out the cutting tool should center on the work.

A rod is cut to the length of the radius required, plus a fraction to allow for the female center. The other end of the rod is turned to a point to seat in the toolpost center. Both female centers should be blunt to allow for the swing of the rod without side binding.

The cut must start from the outside dia towards the center using the power crossfeed. During this operation the carriage feed is left idle, permitting the rod to perform the feeding through its natural arc. Depth of cut is controlled by the tailstock spindle.

Holger Kalldin, Brooklyn, N Y

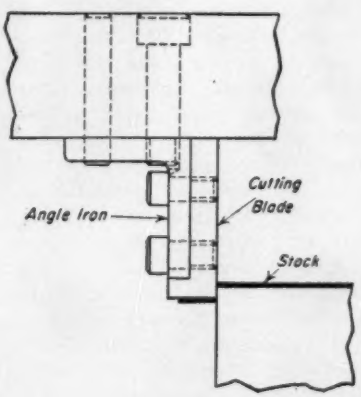
When two or more saws are used on one arbor requiring exact spacing, there will definitely be trouble.

To overcome this deficiency, we use a washer on each side of the blade, with an OD as large as conditions will permit. These large washers will support the blade and prevent it from vibrating or bending.

Besides providing the necessary support, the washers also act as spacers when exact distances must be held between two or more blades.

An undercut of about ⅛ in. on the blade side of the washer assures pressure where it is needed.

Frank La Saracina, New York, N Y



Angle-Iron Mounting Cuts Cost

In most cases when making a die for short-run jobs it is important to keep the cost down to a minimum. All possible ways of reducing the cost should, therefore, be taken advantage of. Illustrated is one method of making an inexpensive punch for cutting-off, notching, and similar operations on light stock.

A piece of angle iron (preferably extra heavy) takes the place of costly tool steel for the body of the punch. A hardened tool-steel blade is bolted to the angle iron with socket head cap-screws. This blade can be made from commercial oil-hardening ground stock to further cut cost in machining time.

If additional strength is needed, the angle iron may be gussetted.

Roger Isetts, Kenosha, Wis

Spring Lap Holds Size And Lasts Longer

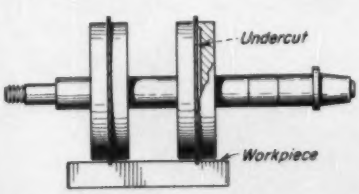
I was once called on to make a lap for an odd-size hole in a hurry. The illustrated design has better action than some elaborate types. For reasons of simplicity, the sketch shows a lap for a ¼-in. hole. Other sizes are roughly proportional.

The material we use is either brass or bronze. It is turned with a back taper of 0.003 in. per inch, and 0.001-in. oversize at the smallest dia. On a 1-in.-long lap this would mean that it is 0.004-in. larger than the hole size at the forward end.

The neck, or undercut, is then turned to a dia 75% of that of the lap size. Two flats are filed or machined to a thickness equal to the dia of the neck. The lap is slit lengthwise through its center, and perpendicular to the flats, well past the body of the lap.

This construction seems to exert parallel pressure on the hole because of its back taper and oversize design. I have made and used these laps on diameters from 0.093 in. to 0.750 in. with good results.

J Felix Huber, Sommerville, Mass.



Washers Stabilize Slitting Saw

Slitting saws in thicknesses from 0.020 in. to 1/16 in. are known to be unstable when used on workpieces for some distance. Because of their slight thickness they are inclined to vibrate; as a result the slot will be rough and oversized.

Tailstock Center Automatically Lubricated

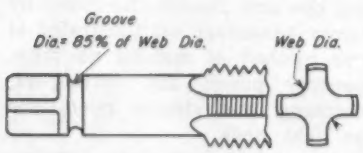
The illustrated lubricator was rigged up to provide an easily regulated supply of oil to the tailstock center. The arrangement includes a drip-feed lubricator, supported by a small magnetic base commonly used to hold dial indicators.

The magnetic base may be placed on the tailstock center, as shown, or on the spindle itself, whichever is best. In this particular setup, the swivel joint rod was run through the loop on the valve ratchet of the oiler. The oiler, thus suspended over the center, is adjusted to feed oil as required.

It may be a good idea to grind a tiny groove, or flat, to provide a channel for the oil to enter the center hole of the work.

This oiler has been particularly useful on work of considerable length where cumulative expansion is caused by temperature rise. This condition will result in binding as soon as the center begins to lose its lubricant.

H J Gerber, Stillwater, Okla



Groove Aids Broken Tap Removal And Salvage

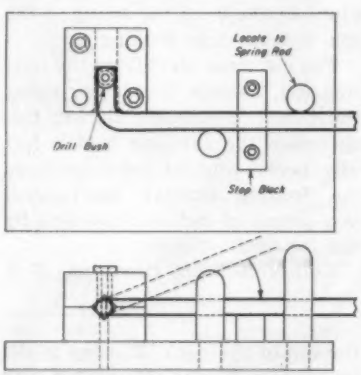
Tap breakage in the shop is always an expensive affair, not only because of the initial cost of the tap, but more so because of the time it takes to remove a broken tap from the work. It is an irritating process to remove a tap without special equipment, and the danger of ruining the thread in the work is great.

It is a known fact that most generally a tap will break at the fluted portion, where the tap is the weakest. We have overcome this tendency by grinding a groove on the shank just below the square drive to a diameter equal to 85% of the dia of the web.

Should the tap be subjected to extreme torque, the tap will break at the groove, leaving a large portion of the shank intact. A mechanic should have no trouble removing the tap with a wrench or locking pliers.

Upon removal, a new driving square may be ground on the tap, making it possible to get additional use from it.

Harold Sedlik, Manchester, Conn



Inexpensive Jig Is Fast Loading

I designed this simple jig for drilling cotter-pin holes in the end of 5/16-in. drag links. Rather than install a clamp, I located two pins to make the work force itself against the locating surface of the jig through its own spring.

Because of the absence of clamps, the jig is quickly and easily loaded and unloaded. All parts are mounted on a single baseplate, keeping construction simple.

A V-block with cap carrying the drill bushing is mounted in a convenient location on the plate. The square hole produced with the V-block and cap should be only big enough to allow easy entry of the work. The two pins are located as before mentioned with a stop block or anvil between them to position the work horizontally.

Berton J Leavitt, Lincoln, Nebr

Winner No. 262

H NORMAN BOLES

won $25 in addition to regular payment for his idea:

COLLET STOP IS HELPFUL

in the issue of Nov 5, 1956

An extra payment of $25 is made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

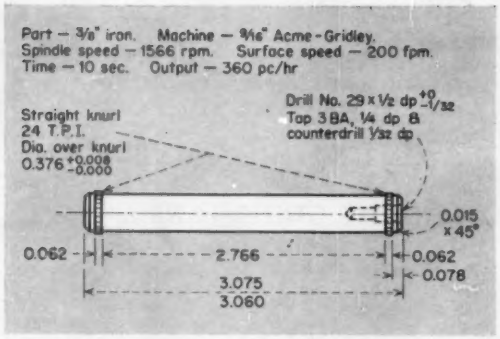
JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

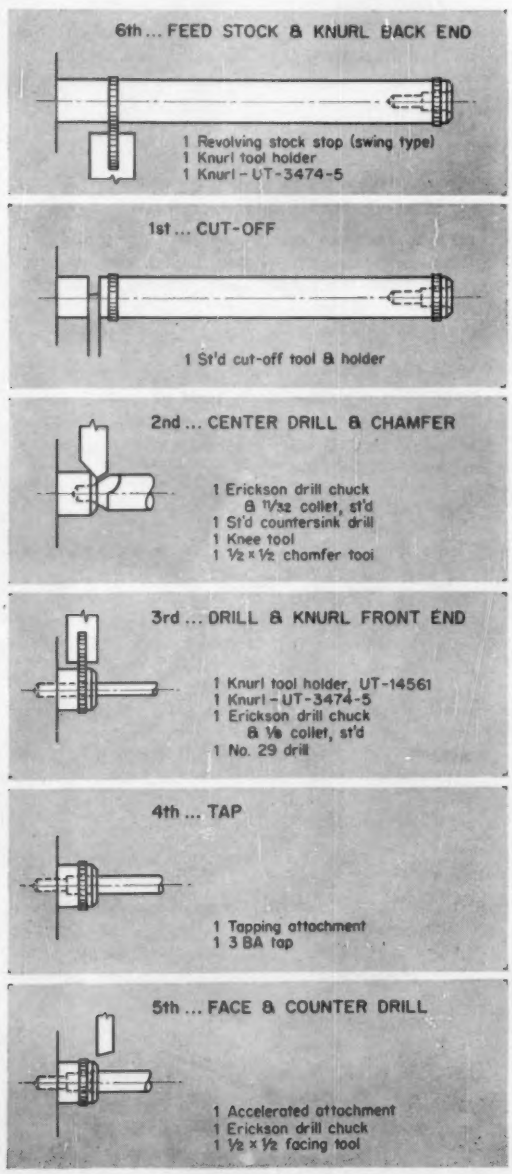
WHO MAY ENTER—Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N Y

American Machinist



MACHINE AND PRODUCT DETAIL


6th ... FEED STOCK & KNURL BACK END
1 Revolving stock stop (swing type)
1 Knurl tool holder
1 Knurl - UT-3474-5
1st ... CUT-OFF
1 St'd cut-off tool & holder
2nd ... CENTER DRILL & CHAMFER
1 Erickson drill chuck & 11/32 collet, st'd
1 St'd countersink drill
1 Knee tool
1 1/2 x 1/2 chamfer tool
3rd ... DRILL & KNURL FRONT END
1 Knurl tool holder, UT-14561
1 Knurl - UT-3474-5
1 Erickson drill chuck & 1/8 collet, st'd
1 No. 29 drill
4th ... TAP
1 Tapping attachment
1 3 BA tap
5th ... FACE & COUNTER DRILL
1 Accelerated attachment
1 Erickson drill chuck
1 1/2 x 1/2 facing tool

TOOL LAYOUT

HOW TO
SET AND USE

Screw-machine standards

SAM K WOOD, senior associate
WELLS & ASSOCIATES, JERSEY CITY, N J

Here are tables of allowances developed by broad experience, and the forms whereby you can figure stock requirements and hourly production on both first and second-operation screw-machine work. This article is based on S-M-S (Screw Machine Standards) data copyrighted by the author. The illustration of the piece part and tooling were supplied through the courtesy of the Federal Telephone & Radio Corp, Clifton, N J

Do you get full utilization of your automatic screw machines on primary and secondary operations? Do you use production standards, or is your operation set by "rule of thumb," with the resultant shortages, over-runs, poor machine utilization and a nebulous scheduling board?

S-M-S is a simplified method for establishing standards on set-up and primary and secondary screw-machine operations. This method will pay off in maximum machine utilization and provide a realistic basis for efficient scheduling.

The services of an "expert" or seasoned time-study man are not required. Almost anyone with a limited working knowledge of automatic screw-machine operations can develop reliable and workable standards, if he can follow instructions with reasonable accuracy.

First, keep in mind that the data used in this study have been accumulated from many sources and are representative of actual, proved times. You can change or substitute any of these data to meet individual conditions. You may add new time values for any special tool that has been or

S-M-S WORK SHEET

DESCRIPTION CORE PRINT NO. ULP 24001 PART NO

MACHINE GRIDLEY MODEL RA 6 9/16 GEARING CAM SPEED SEC.

SECONDARY MACHINE MODEL OPERAT

MATERIAL IRON ROUND SOLID DIAMETER 3/8 (0.375) ROD LENGTH 144"

PURCHASER P.O. NO. DATE WANTED

SPECIAL INSTRUCTIONS:

Line	Refer	Description	Inch
1	PRINT	PART LENGTH	3.075
2	CHART A	PLUS CUT OFF ALLOWANCE (1)	0.084
3		PIECE LENGTH	3.159
(1) INCLUDE ALLOWANCE 0.010" IF FACING TOOL IS USED.			
4		ROD LENGTH INCH	144
5	CHART B	LESS SCRAP ALLOW.	2
6		WORKABLE ROD	142
7	LINE 6 / LINE 3	= PIECES PER ROD	45
8	60 / LINE 7 x LINE 26	= RODS/HR.	8

(2) SECONDARY OPERATION: TIME THE POSITIONING AND AWAY OF THE PART

Line	Refer	Allowances	%
9	CHART C	NO 8 RODS	0.0575
	CHART	PERSONAL	0.0300
10	D	FATIGUE	
		DELAY	0.0200
11	CHART E	MACHINE UTILIZATION	0.0520
12	CHART F	NUMBER TOOLS	0.0075
13	CHART G	TOOLS	
14	"	STOP	0.0005
15	"	KNURL	0.0010
16	"	CUT OFF	0.0187
17	"	DRILL	0.0070
18	"	CHAMFER	0.0046
19	"	DRILL	0.0070
20	"	KNURL	0.0010
21	"	TAP	0.0015
22	"	FACE	0.0046
23	"	DRILL	0.0070
24	"		
25	"	TOTAL ALLOWANCE	0.2199

Line	Refer	
26	CHART H	BASE
27		0.2199 LINE 25 x LINE
28		LINE 26 + LINE
29		SECONDARY OP
30		INCENTIVE %
31		LINES 28+29+
32		60 / LINE 31 = PIE
33		1 / LINE 32 = HOU
34		LINE 33 x JOB
35		SET LINE 34 + SET

may be developed in your shop. On the whole, however, you will find the material, as presented, capable of use under almost every condition.

The ramifications of a complete production-standard program in a screw-machine department are varied. Therefore, only the elements involved in development of the standards will be discussed.

In the use of production standards, a definite operating procedure must be developed and followed constantly to obtain reliable results.

GENERAL ASSUMPTIONS

Assume that when a production run has been completed, the tools are removed and returned to the toolcrib where they are cleaned, sharpened and made ready for the next run. (See also: "General Conditions," on reverse side.)

In preparation of the Set-Up Allowance work sheet, apply the time values taken from the appropriate charts. In the example shown, the allowed time to remove tools and set up the machine to run the part No. ULP24001 is 2.73 hr without an incentive allowance.

In the preparation of the Work Sheet, the following items and information should be assembled.

Part print
Machine to be used
Cam speed
Kind of tools
Number of tools
Material: diameter, shape, length
Set-up allowance sheet
Work sheet
Charts A to H

RT NO. ULP 24001

C. 10 BASETIME 0.1666 DEC. MIN.

ERATION

4" INCHES LOT SIZE 10,000

PROMISED

Computation	Time
BASETIME	0.1666
2.199 X 0.1666	
x LINE 26 = ALLOWED TIME	0.0366
+ LINE 27 = NORMAL PIECE TIME	0.2032
ARY OPERATION TIME (2)	
(29)	
VE % x LINE (28) = INCENTIVE ALLOWANCE	0.0406
1+29+30 = STANDARD TIME/PIECE	0.2438
= PIECES/HOUR	246
= HOURS/PIECE	0.00406
10,000	
x JOB QUANTITY = JOB RUN HRS.	40.6
ET UP 2.73 / 40.6	
+ SET UP TIME = TOTAL HRS./JOB	43.3

Complete the heading of the work sheet by filling in all required information. For the body of the work sheet, a step-by-step explanation is:

Line 1... From the print, determine length of finished part. 3.075 in.

Line 2... From Chart *A*, find the cut-off allowance for the diameter of the material, ⅜ or 0.375 in. .....0.074 in. If a facing tool is used, add .....0.010 in. 0.084 in.

Line 3... Total of Lines 1 and 2 3.159 in.

Line 4... Rod length. If rods are random lengths, estimate an average length of 12 ft = 144 in.

CALCULATION OF SET-UP ALLOWANCES

Machine GRIDLEY RA6 9/16 Part No. ULP 24001

ELEMENTS	MINUTES
1. REMOVE FORMER SET-UP	
Include Tools - Cams - Gears, Etc.	15
2. SET-UP ALLOWANCES	
Check Tools And Layout	6
Change Gears	3
Assemble Cams	5
Place And Adjust, Collets, Feed Fingers,	
Holders, Etc. 1, 2, 3, 4 Or 5 Spindles.	55
3. MOUNTING TOOLS	
Includes Setting Stop - Adjusting Cut To 0.001	
Box Tool	
Center Drill & C. Sink & Chamfer	5
Counter Bore & Ream	
Cross Drill & Attachment	
Cut-Off	10
Die Head	
Drill 3 at 6 min.	18
Face	10
Form, Rough or Finish	
Knurl 2 at 6 min.	12
Pickoff	
Ream	
Recess Or Bore	
Shave	
Slotting Attachment	
Tap	10
Thread Roller	
Turret	
(Add 10 Min. For Each Tool Held to .0005 or Less)	
4. INSPECTION TIME (5 PIECES)	15
TOTAL TIME IN MINUTES	164

COMPUTATIONS	TIME
164 ÷ 60 = 2.73	
Total Minutes ÷ 60 = Normal Time	2.73
Incentive % x (P.F.D. + Normal Time) =	
Set-Up Time =	

Continued on reverse side

CUT-OFF & SCRAP ALLOWANCES			
	CHART A		CHART B
ROD DIA. IN.	CUT-OFF (1) W/Hole	No Hole	SCRAP PER ROD
0.062" - 0.312"	0.055" -	0.056"	2.00"
0.343" - 0.500"	0.072" -	0.074"	2.00"
0.500" - 0.875"	0.081" -	0.100"	3.00"
0.875" - 1.000"	0.100" -	0.105"	3.00"
1.000" - 2.000"	0.125" -	0.125"	3.00"

(1) Add 0.010" to "A" if Facing Tool is used.

CHART C ROD ALLOWANCE (Loading)			
RODS /HR.	BROWN-SHARPE CLEVELANDS	DAVENPORT A	DAVENPORT B
1	0.0060	0.0060	0.0075
2	0.0070	0.0100	0.0150
3	0.0090	0.0150	0.0225
4	0.0120	0.0200	0.0300
5	0.0150	0.0250	0.0355
6	0.0180	0.0300	0.0420
7	0.0210	0.0350	0.0500
8	0.0240	0.0400	0.0575
9	0.0270	0.0450	0.0650
10	0.0300	0.0510	0.0725
11	0.0330	0.0550	0.0775
12	0.0360	0.0600	0.0850
13	0.0390	0.0650	0.0975
14	0.0420	0.0700	0.1050
15	0.0450	0.0750	0.1125
16	0.0480	0.0800	0.1200
17	0.0510	0.0850	0.1275
18	0.0540	0.0900	0.1350
19	0.0570	0.0950	0.1425
20	0.0600	0.1000	0.1500

CHART D PERSONAL ALLOWANCE		
KIND	FIRST OPERATIONS	SECONDARY OPERATIONS
PERSONAL	0.0300	0.0600
FATIGUE	NON ALLOW.	0.0700
DELAY	0.0200	0.0500

THESE ARE GENERAL ALLOWANCES. DEVELOP ALLOWANCES TO MEET CONDITIONS IN YOUR PLANT.

CHART E MACHINE UTILIZATION	
If machines are shut down during Lunch, Rest or Clean Up periods, allow the following percent.	
30 MINUTES LUNCH PERIOD	0.0625
10 MINUTES REST PERIOD	0.0208
15 MINUTES CLEAN UP PERIOD	0.0312

CHART F TOOL ADJUSTMENT		
	ALLOWANCE IN PERCENT	
NO. OF TOOLS	STEEL	BRASS
3	0.0034	0.0039
4	0.0039	0.0045
5	0.0045	0.0051
6	0.0051	0.0057
7	0.0057	0.0063
8	0.0063	0.0069
9	0.0069	0.0075
10	0.0075	0.0082

Line 5 ... From Chart *B* select the scrap allowance for a ⅜ in. rod — 2 in.

Line 6 ... Corrected length of rod. Subtract line 5 from line 4 — 142 in.

Line 7 ... Number of pieces per rod. Divide length of rod (line 6) by pc length (line 3) — 45

Line 8 ... Rods used per hr:

$$\frac{60}{\text{Line 7(45)} \times \text{Line 26(0.1666)}} = 8$$

Line 9 ... From Chart *C*, select the percentage allowance for 8 rods — 0.0575

Line 10 ... From Chart *D*, select the P.F. and D. In this case:
Personal 0.0300
Delay ..... 0.0200 — 0.0500

Line 11 ... From Chart *E*, select the machine utilization.
10-min rest period 0.0208
15-min. clean-up period ..... 0.0312 — 0.0520

Line 12 ... Determine the number of tools used and select the

CHART G
TOOL REPLACEMENT

TOOL	ALLOWANCE IN PERCENT	
	STEEL	H-FM BRASS
BOX TOOL	0.0160	0.0180
CROSS DRILL	0.0070	0.0100
CUT OFF	0.0187	0.0261
DIE HEAD	0.0025	0.0025
DRILL	0.0070	0.0100
FORM	0.0210	0.0280
KNURL	0.0010	0.0015
POSITION STOP	0.0005	0.0005
REAM	0.0025	0.0030
RECESS & CENTER BORE	0.0045	0.0050
SHAVE OR FACE	0.0046	0.0050
SLOTTER	0.0006	0.0005
SPOT & C - SINK	0.0045	0.0060
TAP	0.0015	0.0022
THREAD ROLLER	0.0025	0.0025

CHART H
CAM TIME CONVERTED TO BASE TIME

Cam. Sec.	Dec. Min.	Cam. Sec.	Dec. Min.	Cam. Sec.	Dec. Min.
1/2	0.0083	-	-	-	-
1	0.0166	10	0.1666	100	1.6666
2	0.0333	20	0.3333	200	3.3333
3	0.0500	30	0.5000	300	5.0000
4	0.0666	40	0.6666	400	6.0000
5	0.0833	50	0.8333	500	8.333
6	0.1000	60	1.000	600	10.000
7	0.1166	70	1.1666	700	11.666
8	0.1333	80	1.3333	800	13.6666
9	0.1500	90	1.5000	900	15.0000

SET-UP ALLOWANCES

SET-UP ALLOWANCES	Minimu Allowanc
1. REMOVE FORMER SET UP	
INCLUDE TOOL, CAMS, GUARDS, ETC . . .	15.0
2. SET-UP ALLOWANCES	
CHECK TOOLS AND LAYOUT	6.0
CHANGE GEARS	3.0
ASSEMBLE CAMS	5.0
PLACE AND ADJUST COLLETS AND FEED FINGERS, HOLDERS ETC.	
1 SPINDLE	10.0
2 SPINDLES	20.0
3 SPINDLES	25.0
4 SPINDLES	35.0
5 SPINDLES	45.0
3. MOUNTING TOOLS	
INCLUDES ADJUSTING CUT TO .001" AND SETTING STOPS	--
BOX TOOL	20.0
CENTER DRILL AND C. SINK & CHAMFER	5.0
COUNTER BORE & REAM	5.0
CROSS DRILL & ATTACHMENT	15.0
CUT OFF	10.0
DIE HEAD	20.0
DRILL	6.0
FACE	10.0
FORM	10.0
KNURL	6.0
PICK-OFF	8.0
REAM	15.0
RECESS OR C. BORE	8.0
SHAVE	10.0
SLOTTING ATTACHMENT	30.0
TAP	10.0
THREAD ROLLER	10.0
TURRET	6.0
FOR EACH TOOL HELD TO +0.0005 OR LESS LESS ADD	10.0
4. INSPECTION TIME 1ST 5 PIECES.	15.0

allowance from Chart *F*
10 tools 0.0075

Line 13 through 24. List all tools, select percentage allowance from Chart *G*:

Adjust stop	0.0005
Knurl	0.0010
Cutoff	0.0187
Drill	0.0070
Chamfer	0.0046
Drill	0.0070
Knurl	0.0010
Tap	0.0015
Face	0.0046
Drill	0.0070 0.0529

Line 25 . . . Total allowances. Lines 9 through 24. 0.2199

Line 26 . . . Enter the base time. (Cam speed of 10 sec. converted to decimal min.) 0.1666

Line 27 . . . Allowed Time: Base time (Line 26) times allowances (Line 25). 0.0366

Line 28 . . . Normal piece time. Total of Lines 26 and 27. 0.2032

Line 29 . . . Secondary operation not included. ——

Line 30 ... Incentive allowance. In this instance, 20%. 0.0406

Line 31 ... Standard time per piece: Total lines 28, 29 and 30 0.2438

Line 32 ... Pieces by hr. (60 min. divided by line 31). 246

Line 33 ... Hours per piece. 0.00406

Line 34 ... Job run. Line 33 x job quantity (10,000 in this instance). 40.6 hr.

Line 35 ... Total hr per job. Set-up time (2.73 hr.) plus line 34 43.3

Many automatic screw-machine items require a secondary operation, as in the case of the ULP24001. This piece must be finished faced to its proper size. The facing operation is performed on a B & S #OG with a hand-loaded hopper holding 30 pc, and the machine operates on a 7.5 sec. cycle. One facing tool is used on a cross-slide. The automatic hopper feed is designed to take six similar pieces, each of a different length. Because this machine operates as a single-purpose unit, no setup allowances are used. The pieces are hand loaded into the hopper with the rough end cut in one direction, and are automatically ejected when finished.

The standard time for the secondary operation is worked out in the same manner as for the primary operations, except that Lines 1 through 9 are disregarded:

Line 10. Personal time. 0.0600
Delays 0.0500

Line 11. Machine utilization and clean up. 0.0312

Line 12. Number of tools: 1 (Use minimum: 3 tools). 0.0034

Line 13. Facing tool. 0.0046

Line 25. Total allowance percent. (Lines 10, 11, 12 and 13.) 0.1492

Line 26. Base time. (7.5 sec. converted to decimal min.) 0.1249

Line 27. Allowed Time: Line 25 times Line 26. 0.0186

Line 28. Normal piece time. (Line 26 plus Line 27.) 0.1435

Line 30. Incentive allowance. (20% of Line 28.) 0.0287

Line 31. Standard time per piece. (Lines 28 and 30) 0.1722

Line 32. Pieces per hr. (60 divided by line 31.) 348

Line 33. Hours per piece 0.00287

Line 34. Job quantity. (Line 33 times 10,000.) 28.7 hrs

Production standards are of little value unless they are backed by a planned scheduling procedure that will bring about a maximum balanced machine utilization, controlled production runs and meeting the promised delivery date.

GENERAL CONDITIONS

MACHINE OPERATOR

Machine operators will record on the job cards any unusual conditions not encountered in a normal day's work, such as power failure, slipping or broken belts (if used), crack ups (crack ups do not include tool changes or tool adjustments), waiting for stock, the foreman or set up man. The operator will also record the running of less than the specified number of machines, or using by necessity, the wrong gears or cams on machines which do not have the capacity specified for the part being run.

MATERIAL HANDLER

The material handler will maintain the proper level of bar and rod stock on the stand under or close to the rod reel. He will also move finished pieces from the machines to the next operation.

CHIP PULLER

The chip puller will clean the machine and the pan when a change over from brass to steel, or from steel to brass is made. He will also move the chips periodically. (Twelve minutes per machine to wash pans).

SET UP MAN

The set up man will draw from the tool room the new set up: cams, gears, holders, collets and gages for the set up, prior to the completion of the job being run in the machine to be changed. Set up man will wash tool slides whenever a changeover in type of metal is made.

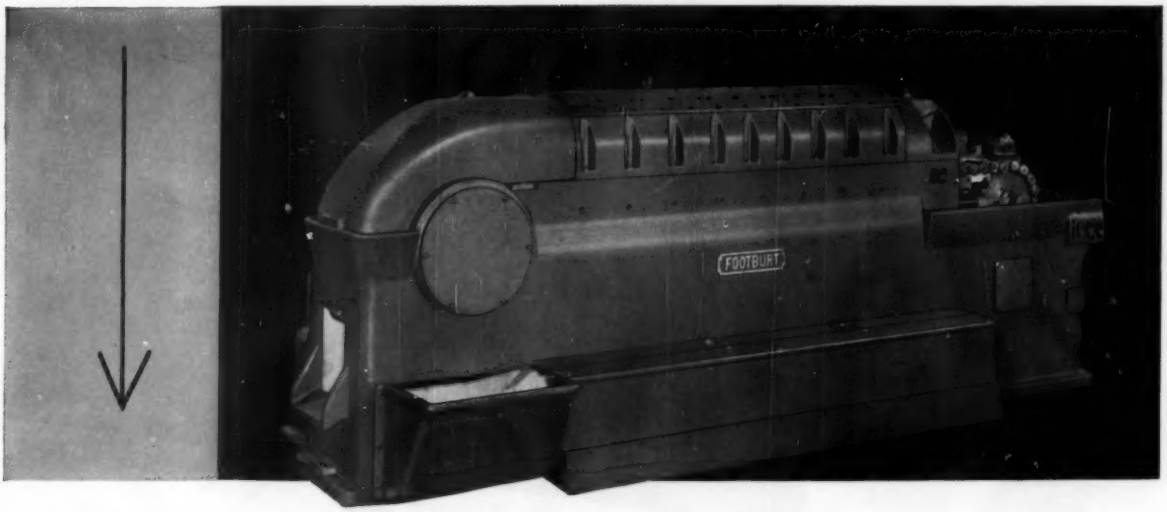
FIRST OPERATION

The number of machines per operator will depend upon the layout of the machines. One operator generally can take care of 4 B&S or Clevelands or 3 Davenports or New Britains.

SECONDARY OPERATIONS

On secondary operations the number of machines one operator can handle will depend upon layout arrangement, the load, away and travel time. If the machine times are .75 min. or more the operator can run two machines. Time study the machine loading and unloading, travel time between machines and enter on line 29 of the secondary operation work sheet.

The Multiple Machine Standard of each machine is figured by dividing the Std Hrs per 100 pieces (line 33) by the number of machines operated.



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■ Higher machining production than ever achieved by any other method has been made possible in many cases through the use of the Footburt Continuous Surface Broaching Machines. In most cases, production is limited only by the speed at which parts can be loaded into the self-clamping fixture. Unloading is automatic. If you have a problem of high production on small parts, send blueprints and hourly requirements.

THE FOOTE-BURT COMPANY
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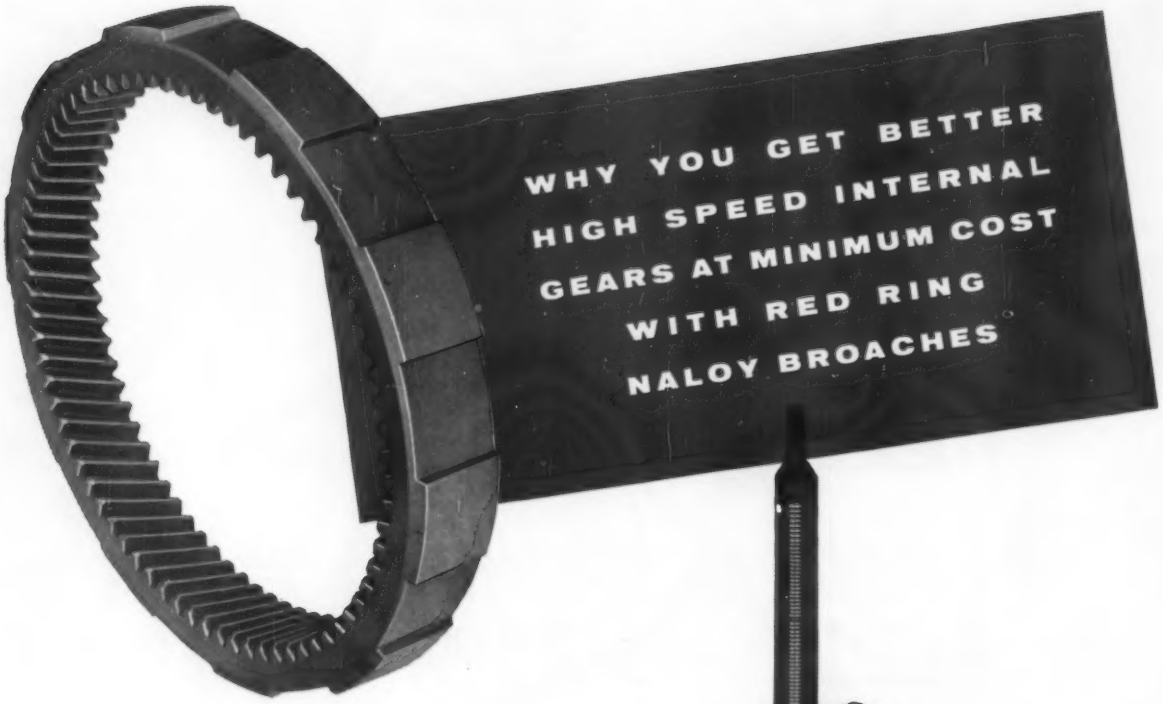
PIONEERS IN SURFACE BROACHING



- Gear is completely cut from the solid blank in just one pass. A quick shaving operation or a finish broaching pass completes it.
- Critical gear characteristics held to tolerances of .0002".
- All gears produced are interchangeable regardless of the number of broaching tools in use.

The secret of combining spectacular economy with such high gear precision lies in the broaching tools themselves. Special manufacturing processes are used. Each is under the constant control of Red Ring metallurgists and engineers in this company's own plant.

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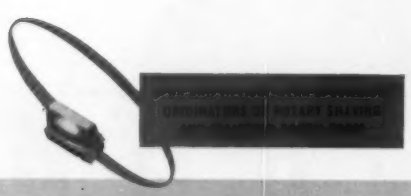

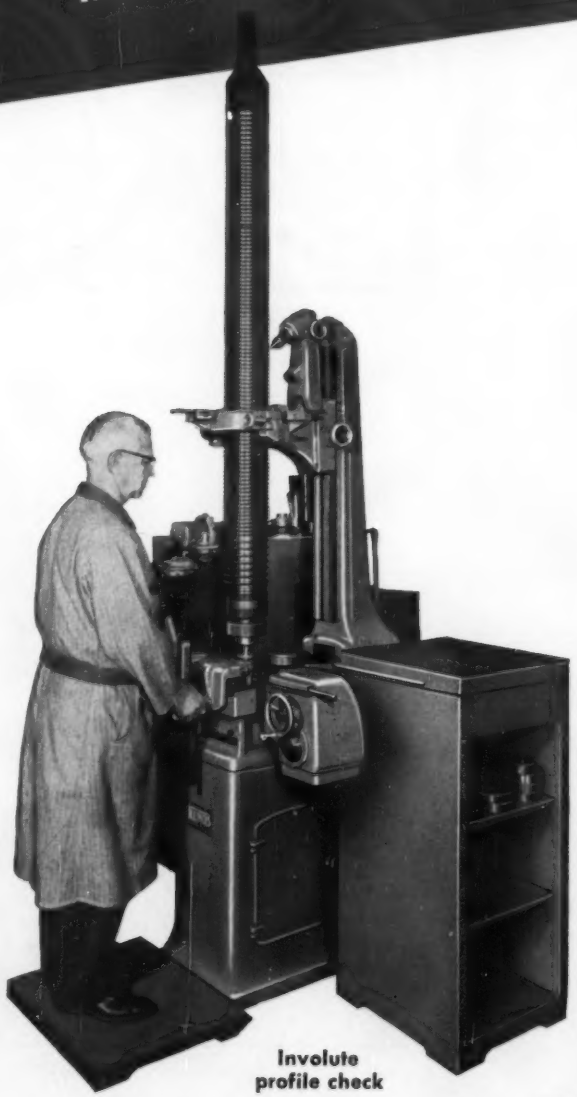

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WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

American Machinist REFERENCE BOOK SHEET

CROSS-TRANSFER DIES...I

DON R KING

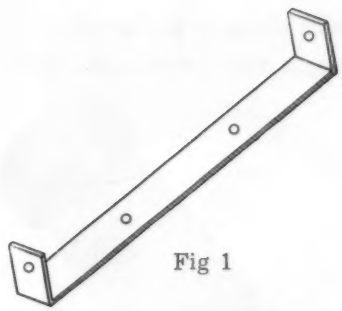


Fig 1

In design of progressive dies, a frequent problem is the need to provide additional operations after cut-off. A simple, but often overlooked possibility, is the cross-transfer type of die, in which the part is moved at right angles to the normal feed, in the final station. This movement allows one or more additional operations to be performed. Many multiple-bend parts can be handled in this manner. The method is also helpful in the case of very long pieces, where an extra in-line station would result in a die of abnormal length.

A simplified example of a typical part is illustrated in Fig 1. Assume that the piece cannot be run from wide stock, either because of grain-direction requirements, or because round edge, flat wire is specified. The use of cross transfer, as shown in Fig 2, results in a compact die of reasonable dimensions, not attainable with conventional in-line treatment.

In Fig 3, the parts shown at *A* and *B* are typical of multiple-bend pieces which are easily handled by means of cross transfer in the final station, of what is otherwise an in-line progressive die. The application will be obvious, but note that more than one transfer station is possible, part stability permitting, and that operations other than bending may also be included in the transfer stations. At *C*, in Fig 3, a common problem in a progressive die is shown. Here, because of operation requirements in preceding stages, a "form-down" becomes necessary. This operation precludes further motion in the direction of stock feed. Here, again, cross transfer allows further operations.

An essential component of all cross-transfer dies is the shuttle or feeder mechanism. The device may take many forms, depending on the part and space requirements. A simple type is seen in Fig 4, p 143, from which many variations may be developed to suit your needs. A light frame, sliding in gaps or slots in the die block, is provided with feed dogs to engage the part. In operation, the shuttle is cammed down, and then to the front of the die, passing under the parts or stock, during the working stroke of the press. On the up stroke, the shuttle is spring returned, feeding another part into position. A pivoted blade in the cam gives a slightly delayed, snap action.

◀ Fig 2

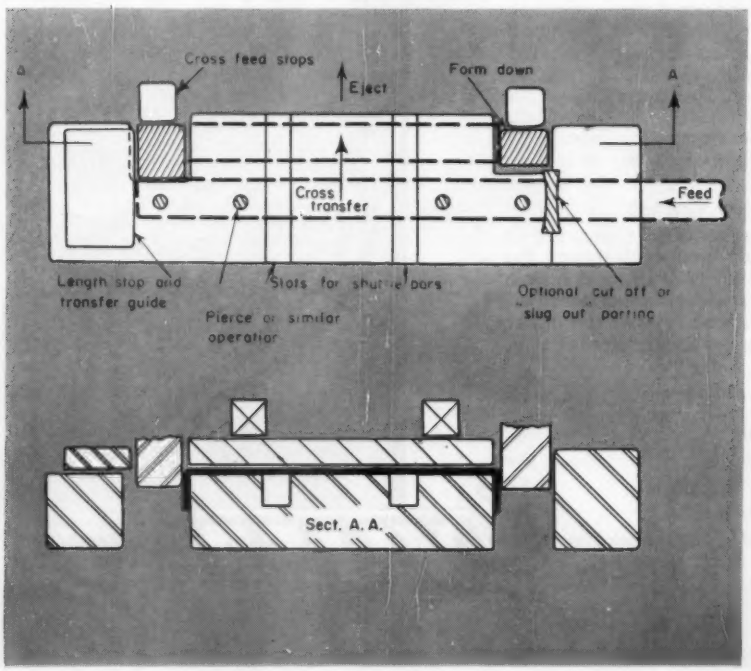
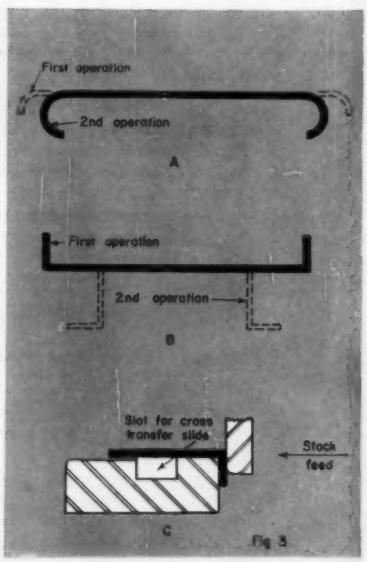
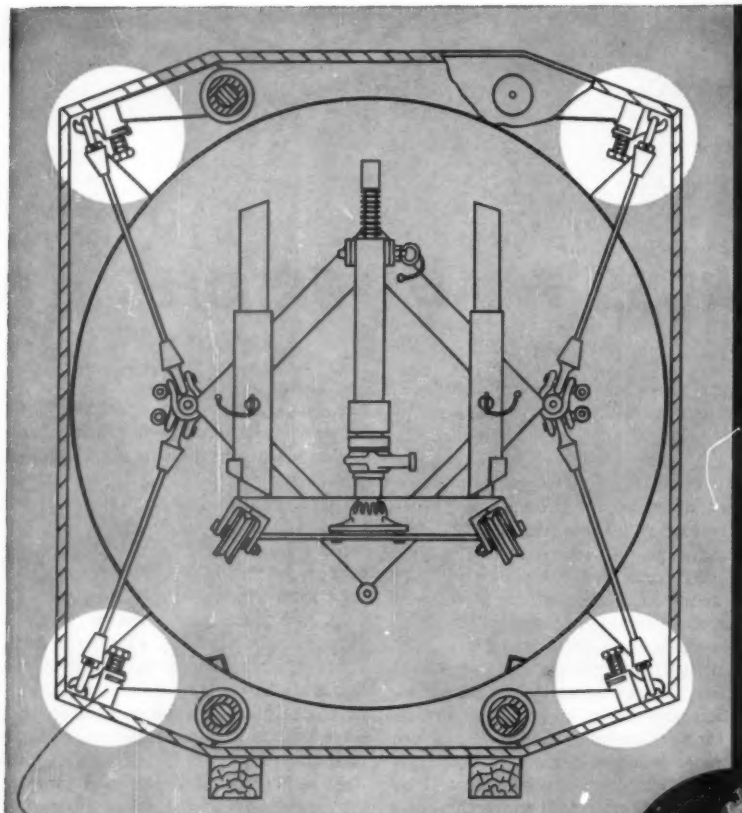


Fig 3 ▼

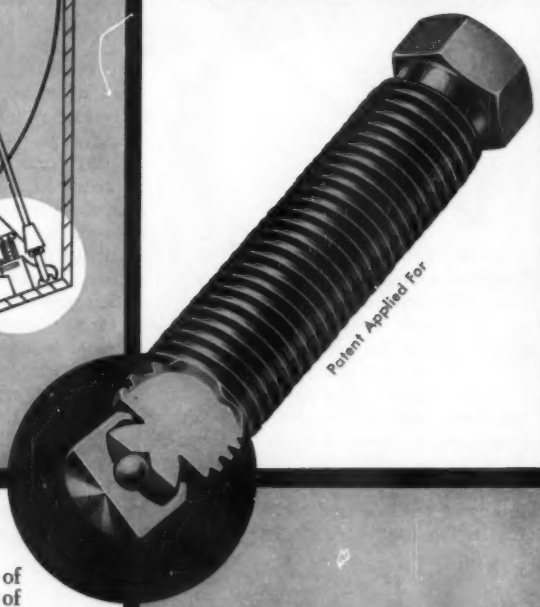




Vlier makes only the Swivel-Pad Clamps. The container is a product of American Pipe and Steel Corporation, Alhambra, California.

Vlier Ball-joint clamps

solve clamping problem for missile container manufacturer



The remarkable ball-joint design now used in thousands of Vlier Swivel-Pad Clamps can be adapted to a variety of clamping and holding applications. The drawing above of a missile shipping container demonstrates one adaptation which solves a particularly difficult problem. Eight special Vlier Swivel-Pad Clamps are used to release tension on cables which suspend the missile in its shipping container. Radar manufacturers are also using special Swivel-Pad Clamps to prevent damage to sensitive instruments during shipment.

PROTECTS SURFACE OF THE PART

The main advantage of the Vlier Swivel-Pad Clamp is that it exerts extreme holding pressure without damaging the surface of the object held. First touch of the pad against the object adjusts the pad face angle and stops pad rotation. The pad can then be tightened to hold the object securely, since the screw torque is absorbed by the pad, not the object.

Perhaps this unique Vlier ball-joint principle can be applied to your clamping problems. Vlier engineers will welcome your inquiries.

BALL-JOINT CONSTRUCTION—Eliminates binding, assuring proper adjustment of the pad against an off-angle surface. The pad swivels 7½° in all directions each side of the center line.

SPECIAL PAD AND SCREW DIAMETERS AVAILABLE—Normally pads are machined from solid stock and are not relieved or counterbored. However, other shapes, sizes, etc., can be designed to meet specific needs.

EXCELLENT STRENGTH—Screws are made from heat-treated alloy steel. Ball-joints have been designed to withstand as much as 21,000 load pounds (1" screw diameter).

VARIETY OF FINISHES POSSIBLE—Standard Swivel-Pad Clamps are Du-lited: however, cadmium, iridite, and other finishes to meet government specifications can be provided.

Insist on Vlier Tooling Accessories...
there's still no substitute for quality.

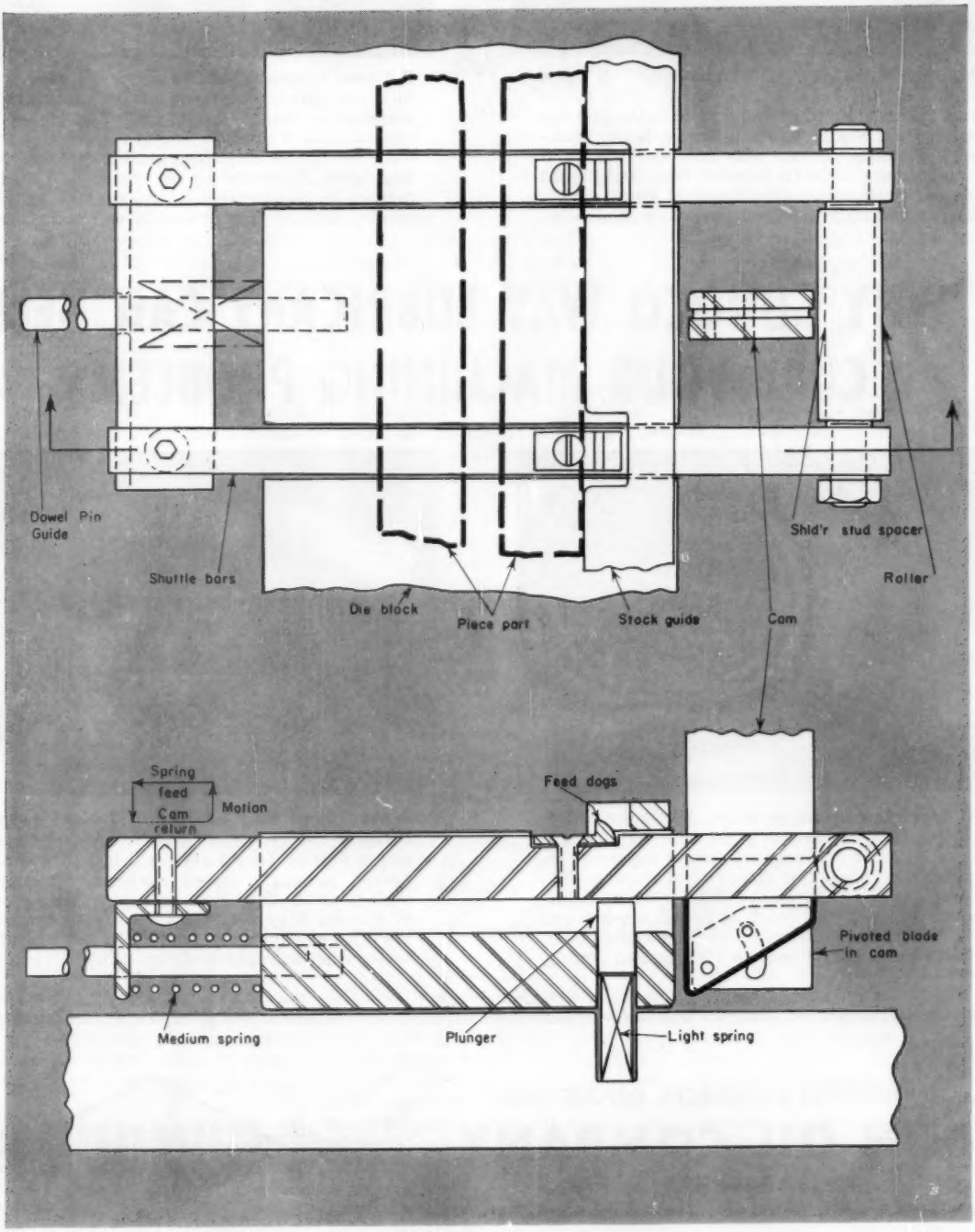
VLIER ENGINEERING INCORPORATED

8900 Santa Monica Boulevard
Los Angeles 46, California

American Machinist REFERENCE BOOK SHEET

CROSS-TRANSFER DIES — II

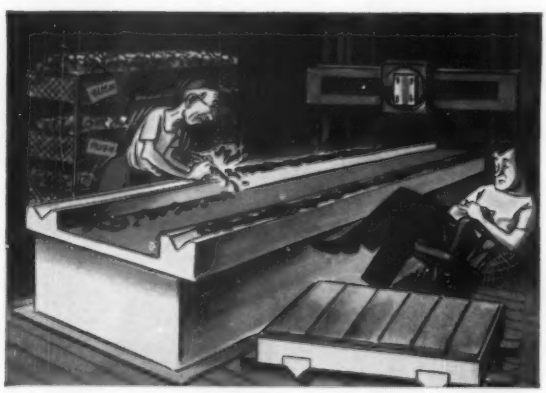
Fig 4



1. Cures "stick-slip" or "jumpy table". When a table gets the "shakes", especially after it has just reversed or when the load is heavy and the speed slow, it's probably suffering from "stick-slip". Remedy—Sunoco Way Lubricant®. Special polar compounds in Sunoco Way Lubricant form a friction-reducing film that keeps a table sliding smoothly under all operating conditions.

2. Doesn't squeeze out. When you use a heavy oil as a way lubricant, you must use a lot of oil to maintain a thick enough film. But, heavy oil squeezes out if the table sits in one position very long. You have a tough time getting the table moving again. Protected by the tenacious thin film formed by Sunoco Way Lubricant, the machine can be idle for a week and it will start easily.

WHY SUNOCO WAY LUBRICANT CAN HELP CURE YOUR MACHINING PROBLEMS



3. Protects expensive ways. Badly scored or pitted ways, caused by inadequate way lubrication, result in lost production and expensive repairs. The high film strength of Sunoco Way Lubricant eliminates the danger of metal-to-metal contact, the chief cause of scoring and way wear. Excellent metal-wetting and non-corrosive properties eliminate rusting and pitting.

For the lubrication of slides
and ways on this machine,
we recommend the use of
SUNOCO WAY LUBRICANT
a product of
SUN OIL COMPANY

4. Approved by more than 55 machine-tool builders. Every major machine-tool builder has tested Sunoco Way Lubricant. It is always approved. In fact, to assure maximum efficiency of their product, many manufacturers ship a supply of Sunoco Way Lubricant with each machine. We'll be glad to send you the list of manufacturers who have approved Sunoco Way Lubricant.

For more information, see your Sun Representative, or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AM-1

INDUSTRIAL PRODUCTS DEPARTMENT

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SUNOCO®

PICKLING OF STAINLESS STEEL

COURTESY CRUCIBLE STEEL COMPANY OF AMERICA

Unless stainless-steel parts have been heat-treated and cooled in an inert-gas atmosphere, they will have surface scale that will impair both appearance and corrosion resistance. Before further fabricating or shipment, these parts must be descaled mechanically or chemically.

Sandblasting. The sand should be clean to prevent contaminating the surface. If the parts are to be used "as sandblasted" they should be passivated; likewise if shotblasting with steel grit is used.

Pickling. Because high-temperature oxide or scale on stainless steel is extremely tenacious, it is often necessary to employ more than one pickling treatment. However, under some annealing conditions the scale can be removed by a "one bath" pickle. Every pickling step must be followed by immersion and complete flushing in clean, clear water.

The most popular "two bath" pickling set-up is:

SOLUTION A

15-20% sulphuric acid (sp. gr. 1.84)

Balance—water

Maintain at 140-150 F

SOLUTION B

15-20% nitric acid (1.42 sp. gr.)

Balance—water

Maintain at 150 F max for austenitic steel, and at room temperature for all other types.

Immerse in solution *A* for not more than 5 min, water rinse and immerse in solution *B*. Five minutes is usually sufficient, and is, of course, followed by water rinsing and drying.

Solution *A* "breaks" or "rots" the scale. Immersion time can be gaged by rubbing the part and noting whether the scale is loose.

Where pickling is virtually the last step, it may be desirable to improve the finished brightness of the part. To accomplish this, 1-2% (by vol) of hydrofluoric acid can be added to solution *B*, and the same pickling cycle used.

Many shops producing relatively small parts (capable of being manually handled) have found the one-bath process most advantageous. For best results, a brittle, dark scale should be produced by annealing in an oxidizing atmosphere.

The bath for this system can be the same as solution *B* given previously, with or without hydrofluoric acid. It may be necessary to scrub the surface to remove all scale.

Additional pickling baths are:

SOLUTION C

Sulphuric acid (sp. gr. 1.84)—8 to 12% (vol)

Rock Salt—¼ lb per gal

Water—balance

Maintain at 150-170 F

This bath is well suited for handling ferritic or martensitic stainless steel, but may be used for austenitic as well. It should be closely controlled, because when the solution is spent it tends to pit all stainless.

SOLUTION D

Sodium hydroxide—10-14% (by wt)

Potassium permanganate—3.6% (by wt)

Water—balance

Maintain at or near boiling. This bath can be used in two ways: (1) as a middle step in the first "two-bath" process, where extremely tenacious scales are not readily removed from austenitic steel by the single two-bath process, and (2) in the case of the ferritic and martensitic steels, as a preliminary step to the two-bath process.

Immersion time can be as long as economic operation permits, because this solution will not affect the steel. Usual immersions are for 20-30 min.

SOLUTION E

Sulphuric acid (sp. gr. 1.84)—5-10% (by vol)

Hydrochlroic acid (sp. gr. 1.19)—2-4% (by vol)

Water—balance

Maintain at 160 F

This solution may be substituted for solution *A* or solution *C*. It is extremely active, necessitating very close control, and when spent it will pit the stainless.

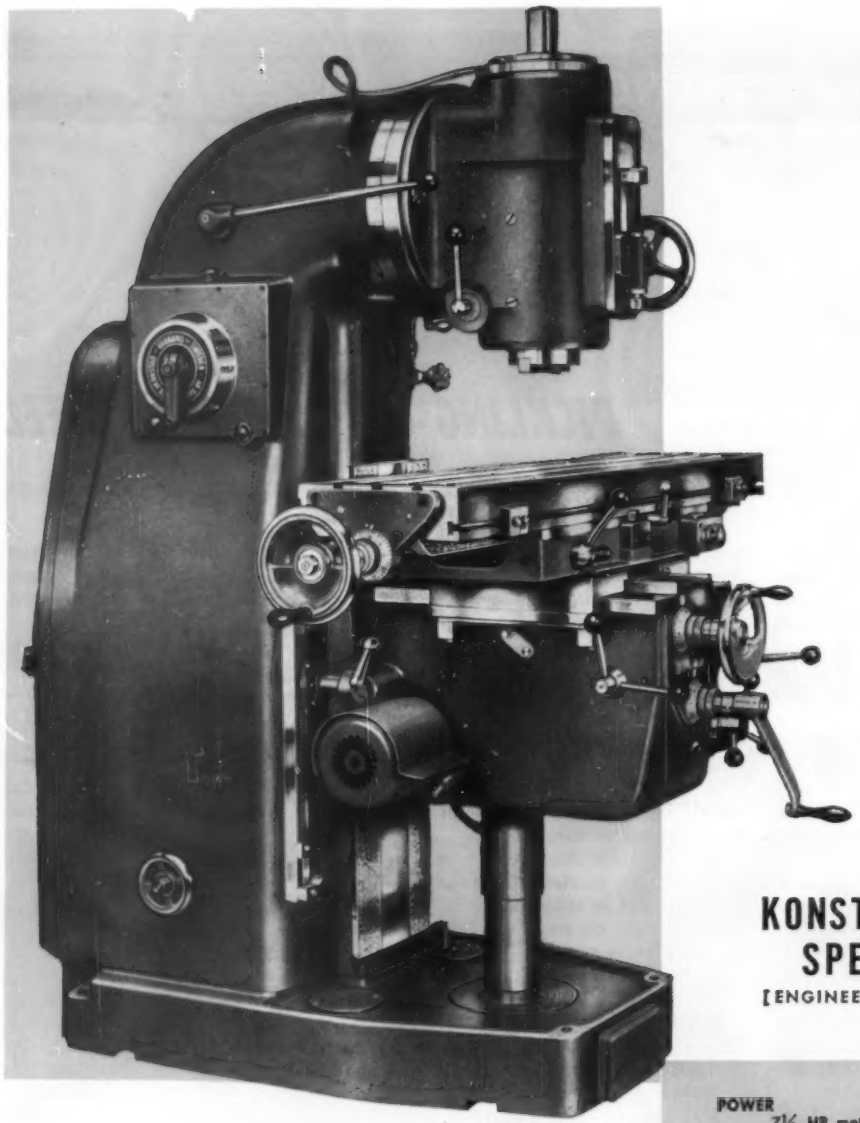
To minimize the pitting effects of all solutions containing sulphuric and/or hydrochloric acid, several inhibitors are commercially available.

Nitric-acid baths, unless maintained at temperatures below 150 F, will fume badly, endangering employees and rapidly depleting the strength of the bath. Fuming can be minimized by addition of commercial foaming agents.

Passivation. A freshly machined part, or one that has had clean surface exposed in any way, will form an oxide film in short time. Passivation treatment will produce a stronger and better film. The treatment should be the final one, because it removes "free iron" picked up by contact with other irons and steels during fabrication.

For the austenitic and ferritic grades, immerse in a solution of 30% nitric acid, by volume, at 120-140 F, for 15-30 min. Follow by a water rinse.

Martensitic grades—and highly polished parts of any stainless steel—require 20% nitric acid at 110-120 F. The addition of 1½-2½% sodium dichromate will prevent surface clouding. Dip the stainless-steel parts in this solution for 15-30 min.



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POWER

7½ HP motor for spindle (5 HP optional).
1½ HP motor for table feed and 3 direction rapid traverse.

RANGE

16 spindle speeds 39-1500 RPM (31-1200 optional), No. 50NMT spindle, 12 table feeds 11/16 to 25 inches/min. longitudinal and cross, 11/32 to 12½ inches/min. vertical. Power rapid traverse, all directions. Table travel 33½" long., 10" cross, 18" vertical.

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Single adjustable START-STOP-BRAKE lever. Dial selection of speeds and feeds (U.S. inch calibrated) with single lever controls. Magnetic motor starter.

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. . . No 4 on RUSSIA

Here is the first detailed report to appear *anywhere on the manufacture of bearings, without use of a single machine operator, in**

Russia's "Automatic Factory"

"I was given the complete run of the factory, allowed to see everything I asked to see, to use my camera without restriction and shoot any questions I wanted to the director, the chief designer, and others responsible for the line.

"It is doubtful whether any journalist has ever had equivalent facilities given him before in Russia."

—*Peter Trippe*
London Staff Editor
American Machinist

***including Russia!**

MOSCOW—Russia has in full production two automatic lines for manufacture of 1.5-million bearings a year in a plant in this city. Facilities are available for making 900,000 ball bearings and 600,000 tapered roller bearings a year without the use of a single human operator.

These fully automated production lines are each an integrated manufacturing unit, having been converted by the Russians from what previously was a semi-automatic operation. They turn out more than 1000 types of bearings in sizes from 1.18 to 63 in. dia, weighing from 300 grams to 4.5 tons. The bearings are made to international sizes for tractors, automobiles and various industrial applications.

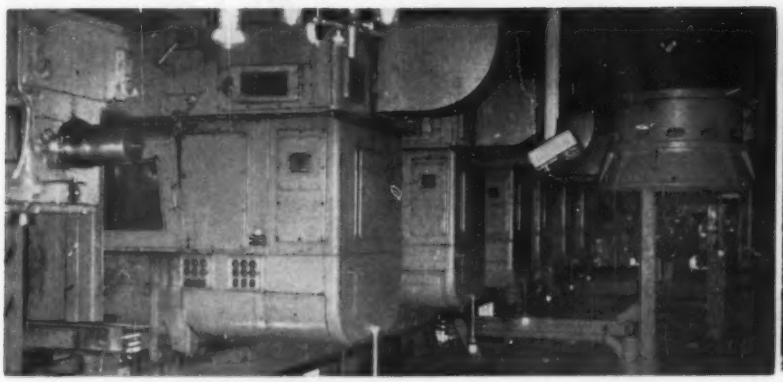
The entire operation, from the plant director down to the cleaner, requires only 178 workers on two shifts, or 89 men a shift. These workers, who include all maintenance men and electricians, control the automatic instruments and keep in repair more than 600 types of special machines or machining units, which embrace 127 main units. These main units consist of 70 metal-cutting machines, a small number of presses for marking and other purposes, and 50 grinding machines (as segregated from other metal-cutting machines).

Half the Workers, One-Ninth the Time

Previous semi-automatic production lines, though highly automated, took nearly twice as many workers. More than that, the entire production cycle consumes only one-ninth of the time that it did. The reason is simple: there is no human intervention from the time of receipt of the rough tube from which the rings are made until the wrapped and labeled cartons come out the other end.

The whole Moscow line has been planned on a basis of segmented automation, using buffer storage hoppers. This setup not only overcomes varying production times for different operations—it also allows buildup of stocks for each section to keep machines supplied in the event of a breakdown of any preceding part of the line.

The ball and roller bearing production lines, in a plant 394-feet long with two bays, occupy an area of about 21,526-sq-ft. The project took only six months on the drawing board. Building and installing the machines and actually getting into production added only 18 months more. Each of the two lines, one for ball bearings and the other for roller



1... Automatic lathes and hopper

2... Transfer arm for lathes

bearings, runs through four main sections—turning, heat-treating, grinding and assembly.

A number of advanced techniques are used. The heat-treating cycle includes deep freeze. Centerless grinding methods have been adapted to internal grinding—for ball-bearing track forms as well as for roller-bearing bores and taper races. Centerless superfinishing with rubber wheels is also employed.

By using new techniques internally and externally for taper races, the Russians claim they improve mutual accuracy between the inner and outer track. And, contrary to expectations, centerless grinding of ball raceways and grooves has achieved much greater accuracy.

The method of superfinishing with a rubber wheel achieves metal removal of not more than 10 to 20 microns from internal surfaces of roller bearings for an exceptional surface finish of Grade 9v-10a on the Soviet scale, which ranges from Grade 1 to Grade 14—the highest finish obtainable. In general, the accuracy limits are comparable to those of top bearing plants in the West.

Once the Russians decided to make bearing manufacture fully automatic, the project proceeded with tremendous speed. The reason for the short cycle is that the government gave top priority to the project.

All available organizations—design and research bureaus, machine tool makers, and the project's own design staff—were focused in a concerted effort. Design and engineering staff of the plant itself numbers among the hundreds.

And in Russia it is a much simpler matter to standardize than it is under our own system of free enterprise. Thus orders for special machines can be spread through the entire machine tool building industry—and each machine tool plant has facilities for making specials. Widespread standardization insures that all machines, irrespective of where they are made, can largely be made from standard parts at a minimum cost in a short lead-time.

In the Moscow plant, mechanization and automation has gone on for five years, and an even more ambitious program is scheduled for the next five years. Technical development is along three lines: designing and creating new automatic lines, modernizing existing processes and machines; and converting semi-optomatic operation to fully automatic, integrated production units.

Questioned as to whether a line as completely integrated as the Moscow bearing one doesn't offset its advantages by a loss of flexibility, Moscow plant engineers said that this had been allowed for in the planning stage—that every machine tool in the line has been designed to accommodate work 15% larger or smaller than that for which it was developed. This gives the line a 30% overall flexibility with no major alterations other than re-setting.

Is a fully automatic line worth the trouble? The Russians' unanimous answer—yes. Primarily, this Moscow bearing line is regarded as just a beginning, not the ultimate. The experience gained in building it will be followed in building new lines that can produce other types of bearings with even higher degrees of accuracy. And when the right time comes, the machines in the Moscow line could be transferred to other, not-fully-mechanized plants. In fact, this year-old plant is already considered by the Russians to be out-of-date. This goes a long way to explain the success of Russian production.

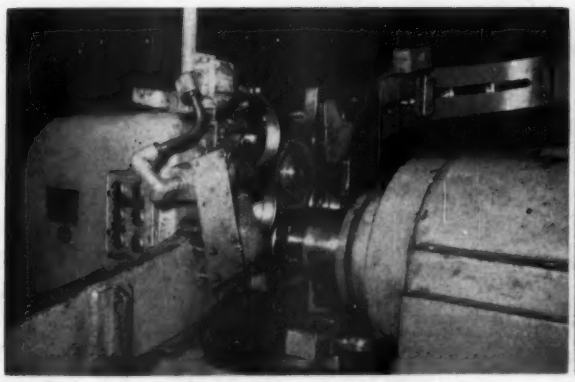
Proof that the Russians are sincere in regarding the Moscow line as just a stepping-off point is that they placed no restrictions on technical details nor on photographs, sure evidence that they figure if Western plants copy the line, Russia by that time will be well into far more advanced techniques.

Maintenance does not provide the complications which might be expected. Centralized control immediately indicates any failure. Most control equipment is electro-mechanical and numerical control is not used, although the Russians may one day use it.

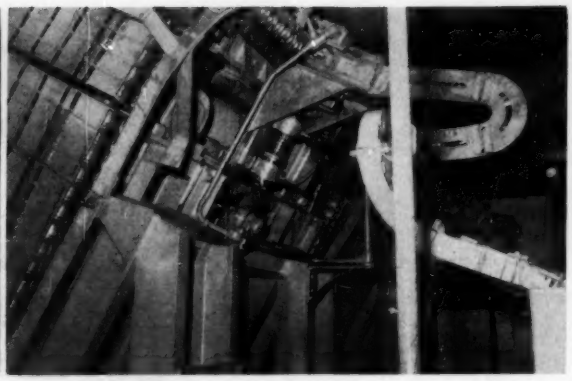
How the Line Works

In considering the Moscow bearing line, it has often been reported in the Western press that it and similar lines are merely showpieces. To believe this is dangerous and a serious underestimation of Soviet abilities. This line is no showpiece—it is a realistic, practical working unit, and it is the shape of things to come. Its many new techniques have been developed on principles tested and proved in Western plants.

Now to the operational details. The Moscow lines



3 . . . Automatic marking unit



4 . . . Storage magazine, outlet side

make the rings and assemble two standard series of ball and roller bearings. Balls, rollers and cages are made elsewhere. The building is not new, and the present layout is hampered by longer conveyor runs than would be needed in a tailored-to-fit building. But the plant is well lit, is adequately heated in winter, air-conditioned in the summer. Floors are clean, with all swarf carried underground.

The entire plant is centrally controlled by the dispatcher's desk. Indicating signals show which processes are operative, which non-operative, and which are under maintenance. Meters show the number of rings that have passed through each section on each shift and for the entire month. The same is true for assembled bearings. Number and types of rejects are also indicated.

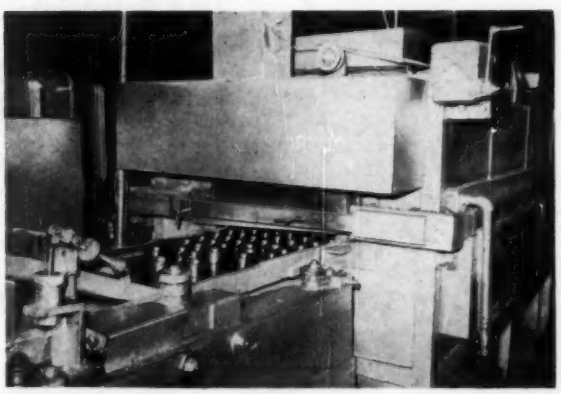
Centralized installations are employed by swarf removal, refrigeration for heat treatment, cooling liquids, washing fluids, etc. Ancillary services include a repair shop, tool crib, and a grinding wheel and abrasive maintenance section. Not a single operator is to be seen on the line.

Rough tube stock and rings come in through doors in the center of the long wall (see "A" on plant layout), are delivered to hoppers (B) and storage (C), preparatory to turning operations. For taper rings, the raw material comes in rings which are loaded into hoppers to feed the automatic lathes.

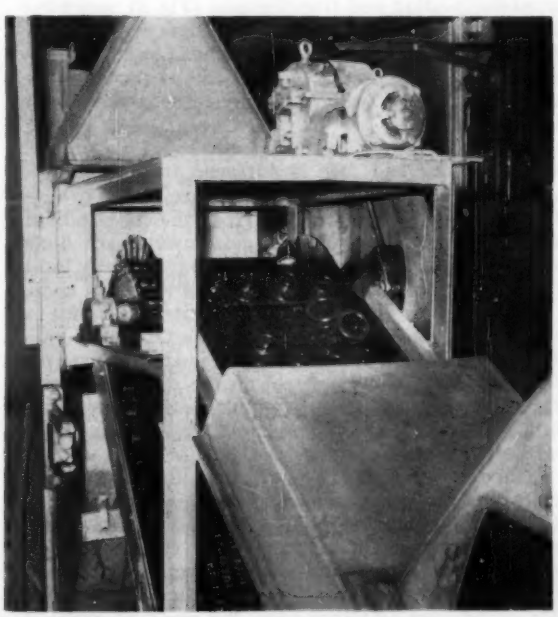
The hoppers have conical rotating floors and are so designed that blanks are orientated for conveying to the lathes. Each hopper carries 250 to 300 chrome steel blanks, which are picked up by an enclosed distributing conveyor (Fig 1). A vertical flight takes them above the level of the lathes, then in a short horizontal run to the main feeder for the turning section battery of six lathes (D and E).

Ball bearing rings are turned from tube stock on another battery of bar automatics (F and G). Lathes for turning the taper rings are all basically similar in design. Three turn inner rings, three turn outers. Each lathe is a duplex 8-spindle model with a spindle at each end, is center loaded. Of the four spindles at each head, one is a loading station, two are work stations, and the fourth is a transfer station.

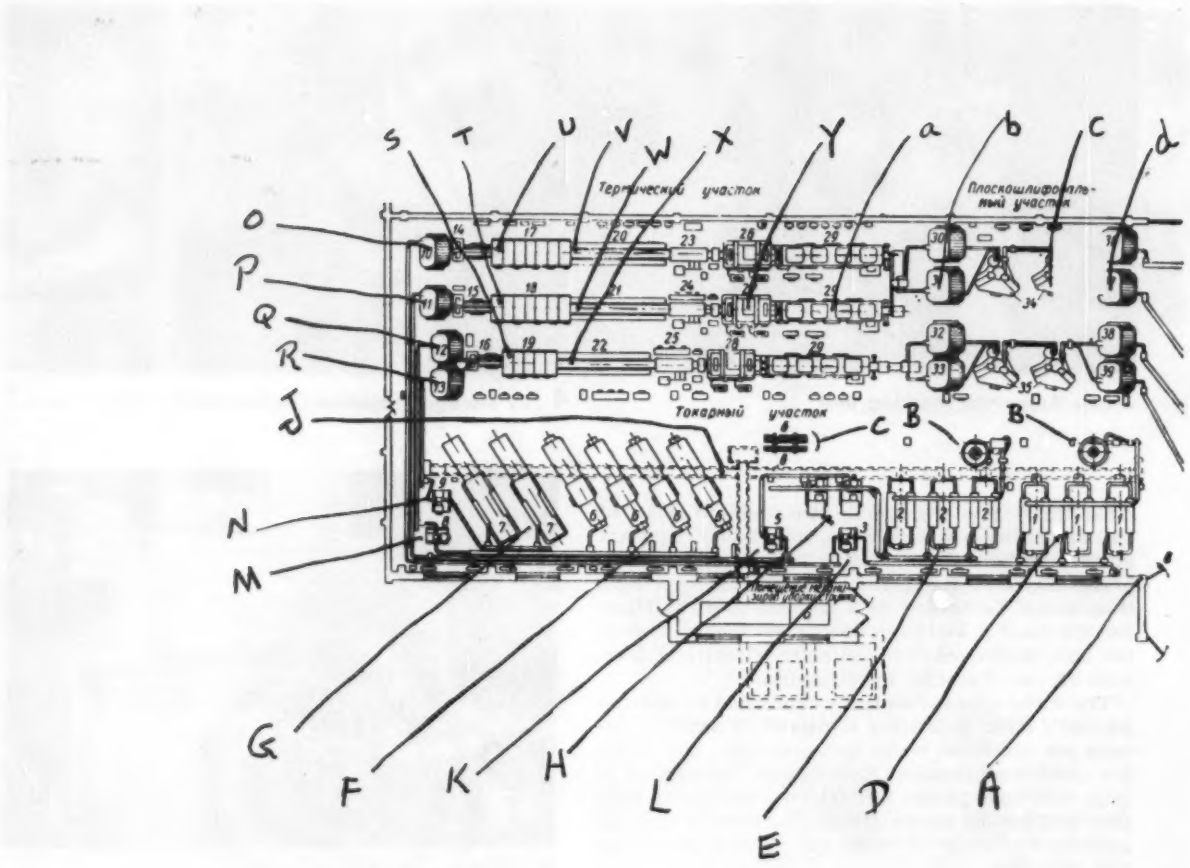
Blank is received from the first head by means of



5 . . . Entrance to heat-treating oven



6 . . . Rings passing from oven to quench



a special loading and transfer arm (Fig 2), mounted on a rugged over-arm. It moves between the two heads, loading blank into the first head and transferring it after machining to the head at the opposite end—and finally feeding the machined component to a conveyor.

Then the OD is turned from the longitudinal slide and the end face is surfaced from the cross slide, and a chamfer put on the bore. Next, a button tool finish-turns the OD from the longitudinal slide, and more chamfering and forming are done with a single tool that feeds in longitudinally, and by a radius cutter and button tool on the cross slide.

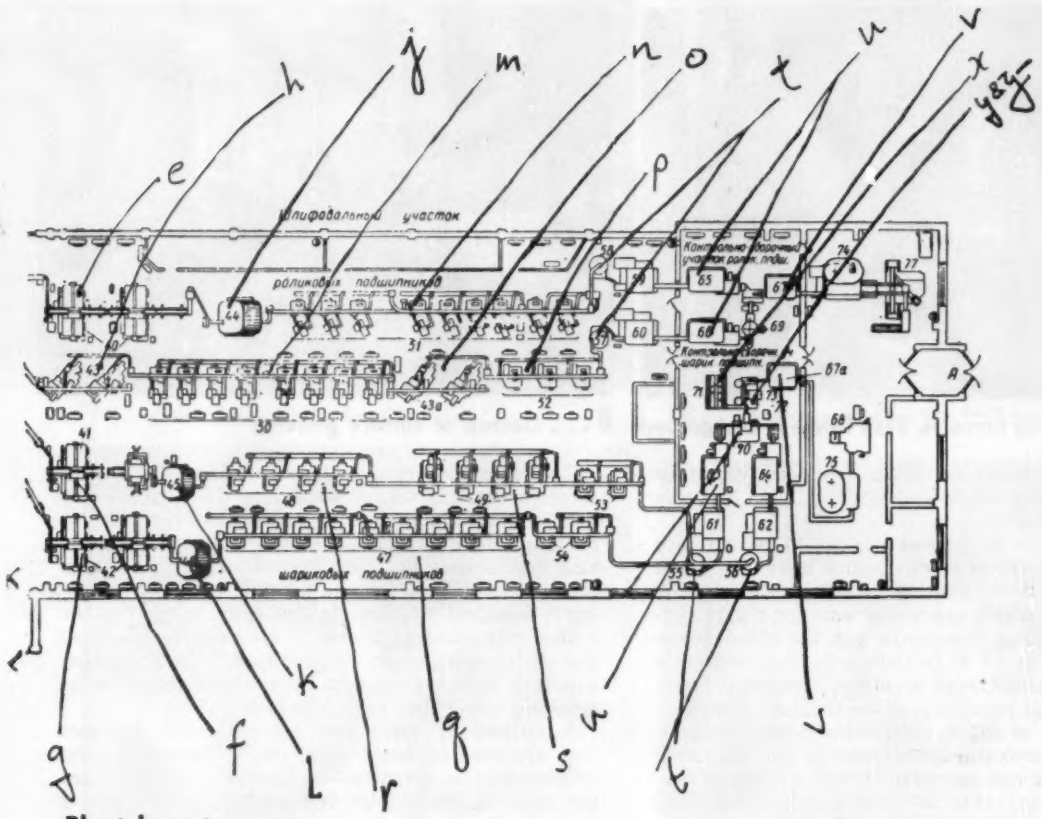
Work moves across to the opposite head and is loaded (Fig 2). It is then held on the OD and a button tool on an angular slide turns the taper form for the race, while a second tool on the cross slide surfaces the end face. Then two tools on the taper angle finish turn the track and chamfer the lip of the bore while a radius tool turns the face.

The external taper rings are then unloaded onto a conveyor. They are turned by three of the six machines, the others turn internal taper rings in an operation similar to that for the external rings. Final operations on the external surfaces for the inner taper ring are carried out on two single-spindle automatics (H) that have the same operational cycle. Their major operation—finish turning the race—is done from the rear slide by a 1.18-in. wide adjustable tangential-action cutter and covers the whole surface of the track. Cutting speed is 393.6 feet per min. The same slide carries two tools for facing the OD of the flanges, while four other tools (two in the top slide, two in the front slide) carry out grooving and chamfering. Operating time is 7 seconds per piece. Spindle does not stop for loading and unloading.

Carbide tooling is used throughout, but because average tool life is only four hours, special methods have been evolved to cut idle time: holders are held by the cutting force, require no clamps; a simple tool pre-setting method allows direct mounting on the machine with no further adjustment—to a consistent accuracy of 0.0008 to 0.0012 in. Time needed to change 16 cutters is only 12 minutes.

Tool life is prolonged by efficient chip breaking, which involves controlling the chip form as it is produced, imparting a movement to the tool-holder to facilitate chip-breaking, and crushing the swarf in the machine. A central coolant system supplies the entire plant. Swarf disposal is done with underground conveyors that feed into a main trunk conveyor (J) that takes it outside.

By comparison with the taper rings, methods for turning ball bearing rings are more or less conventional and do not warrant description. The outer



Plant layout . . .

Reproduced, for lack of time, exactly as Peter Trippe marked it in Moscow

rings are turned on a bank of four two-spindle automatics (F), while the inners are turned complete on two six-spindle automatics (G).

All inner and outer rings for taper and ball bearings are marked after turning. Outer taper rings are conveyed directly from the duplex automatics to one of four automatic marking machines (L), other taper rings come directly from secondary turning operations on lathes (H) to the unit (K), while ball bearing inner and outer rings go from automatics (F and G) to marking units (M and N).

The marking head is horizontally mounted (Fig 3), and a six-station indexing disk is mounted on a vertical axis. As an empty station comes opposite the incoming conveyor, a ring drops into position in the indexing disk. As the disk indexes, it comes between the head of the unit and the stamping head. Work is supported from behind while the stamping head feeds forward, stamps and withdraws.

At the next station, the marked ring drops onto the conveyor shown at left in Fig 3. The whole operation is coordinated as part of the cycle.

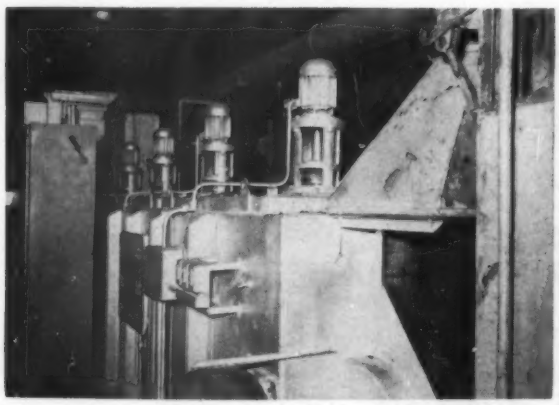
After stamping, rings go to the automatic heat-treating section, which is in the same bay but on the opposite-side and traveling in the opposite direction to that of the turning section, so that when heat treatment is completed, the rings return to the center of the line. Because of differences in cycle times for turning and heat treating, a buffer stock has to be held in special magazines between the two sections. Three heat-treating lines are fed by four magazines. Generally, these magazines (O, P, Q and R) store work enough for two shifts—each holding as many as 3300 ball bearings rings or 1000 roller rings.

From the incoming conveyor, rings enter a vertical zig-zag temporary waiting section then go into the set-at-an-angle oval magazines.

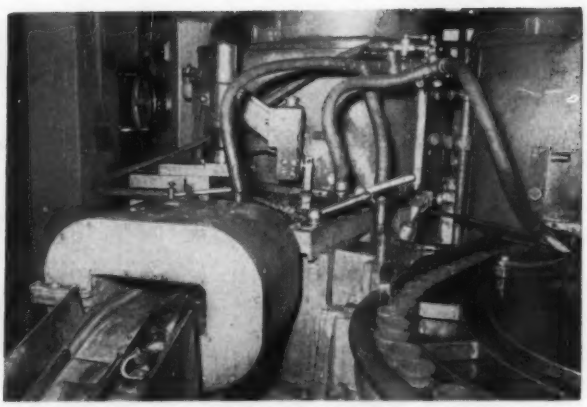
Once inside the magazine (Fig 4), rings lie on their faces in compartments and circulate around the magazine in rows. Rings arrive at the oven conveyors in level rows of five at predetermined times so as to make full use of oven conveyor width. Release of rings from the magazine is controlled by a cam arrangement that releases five at a time. They leave the conveyor in a vertical position, but turn through 90° in the loop so that they are flat when they arrive at the oven conveyor (Fig 5).

A different distributor is used for ball bearings: the inner ring goes inside the outer before alignment. Ovens are electrically heated—those for inner taper rings (S) and ball bearing rings (T) having a reciprocating heat-resistant steel sheet that acts on the vibratory feed principle. One reciprocatory motion of the sheet is made every 6 seconds, inching the rings through the oven at desired speed.

The other oven (U), for outer taper rings, uses a



7 . . . Tempering furnaces, deep freeze in background



8 . . . Closeup of surface grinding

conventional trough-conveyor because vibratory methods might produce out-of-roundness. Furnace temperature is 1594 F.

Rings then go by conveyor (Fig 6) which dips down in a V-shape to an oil-quench bath (V, W and X) under the floor, then up again to the washing machines (Y), which use warm water and soda. After air-jet drying, the rings get the deep-freeze treatment (Z) at 6.8 F. to reduce residual austenite and insure dimensional stability. Cycle: 40 min.

Next the rings pass through the tempering furnaces (a) (Fig 7) at 302 F. completing heat treatment. Rings then go into storage magazines (b), are doled out as required and conveyed to two automatic surface grinders (c) (Fig 8) with face-ground rings ejected, passing through a demagnetizing ring because magnetic chucks are employed. Face-ground rings are fed into another battery of storage magazines (d). It is necessary to use such magazines on both the inlet and outlet sides of the surface grinding operations to balance the time differentials between heat treatment, surface grinding and other grinding, which are considerable. The surface grinders work on both inner and outer rings but even so it is necessary to operate them only 3-4 hr a day.

Outside rings are surface ground during the first half of the shift, inner ones the second half. Changeover takes only 30 minutes. During the operation, a gaging unit checks size and makes automatic compensation for wheel wear. After rings are surface-ground on one side, they are turned over in a conveyor link for grinding on the other side.

Four storage magazines (d) feed four automatic grinding lines: (1) one for grinding outer taper rings, (2) one for inner taper rings, (3) one for inner ball rings, and (4) one for outer ball rings. All OD's, except for the inner taper rings, are ground on pairs of automatic centerless grinders (e, f and g) (Fig 9). These do the job in two passes, where seven passes were formerly required. Improved output is achieved by employing large wheels of 29-in. dia.

The taper track on the OD of inner taper rings is produced on two other centerless grinders (h) by the plunge-grinding method (axis of the wheel is set over at predetermined angle, while control wheel is beveled—contacting surface is at an angle to its axis, which in turn is at an angle to both the axis of the workpiece and the grinding wheel).

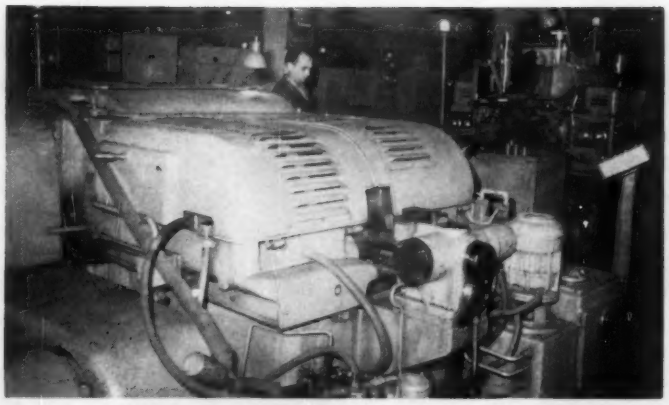
Conveyor feed into the grinders is controlled by a roller running on top of a ring as it enters the grinder line. When the ring moves forward, an arm carrying the roller moves down to bring the next ring into waiting position. Except for the inner races for taper bearings (where output from OD grinding is balanced with subsequent operations), further buffer magazines (j, k and l) are provided because the entire day's quota is produced in one external grinding shift, as against two shifts for internal grinding operations that follow it.

A battery of eight internal centerless grinders (m) are used on inner taper rings. Whereas a shoe is employed in grinding the taper OD, in this case the work is located by two control wheels and a driving wheel. Similar machines (n) rough and finish grind the inner taper races of outer rings. This is done by setting the work over at the required angle. Throughout these operations, the ring has a cylindrical member attached to its small dia. This supports, but does not hold, the ring, and it forms an integral part of the ring through grinding and superfinishing—to insure against distortion. Subsequent operations carried out on the inner taper ring include finish grinding of the taper OD on two centerless grinders (o), and grinding the inside face of the rib (flange) to provide the correct plane to take the rollers' axial thrust (p).

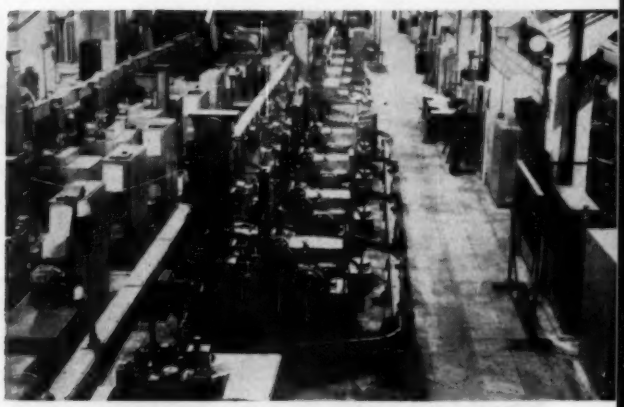
Eleven special machines grind the races of ball bearing outer rings, grinding and superfinishing internal surfaces, including the ball groove itself. The work is driven by centerless principles: the wheel is radiused and enters the bore to contact the formed ball groove; wheel head swings with a reciprocating motion around an axis which produces the desired radius. Internal grinding of the bore of inner ball bearing races is done on a bank of four centerless grinders (r), and another group of four grinders (s) grind the ball grooves on their OD, using form wheels (Fig 10). The two special machines for plunge-grinding the taper track of inner roller rings are shown in Fig 11. Fig 12 shows the external form grinders, and Fig 13 shows a special centerless internal ball-groove grinder.

After grinding, the finished rings go to magazines (t), then are washed before assembly, which is done in a temperature-humidity controlled room.

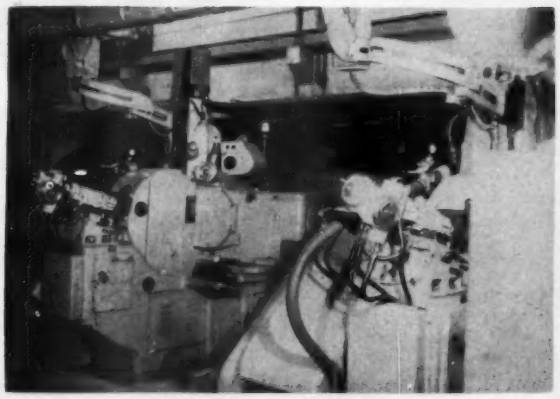
Automatic inspection and gaging machines (u),



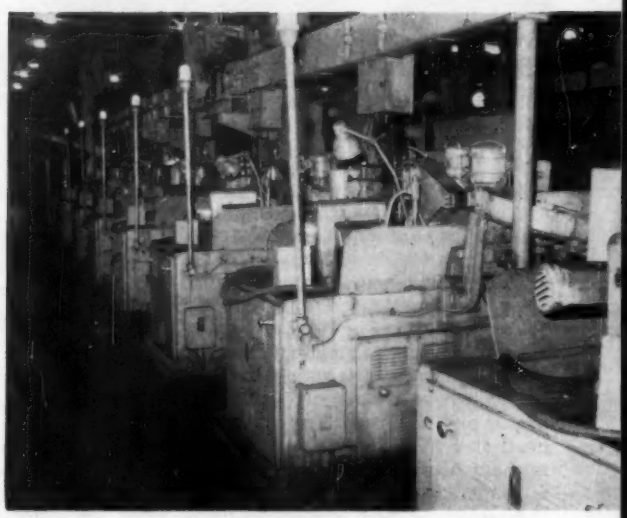
9 . . . Centerless grinder for OD's



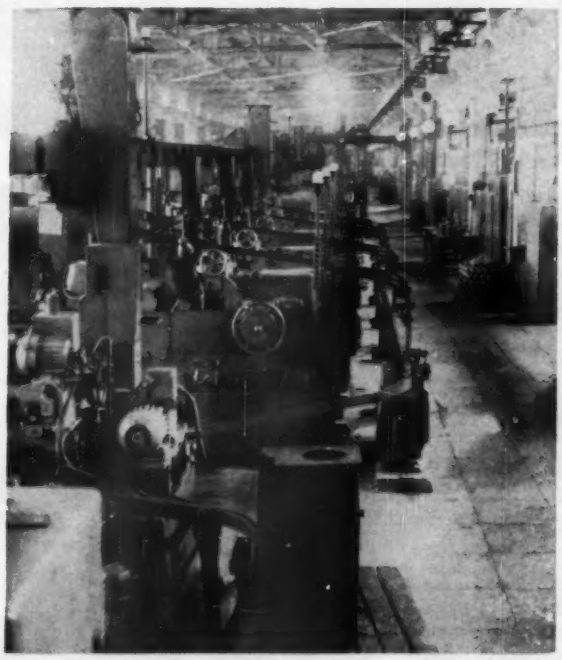
10 . . . Grinding section for ball-bearing races



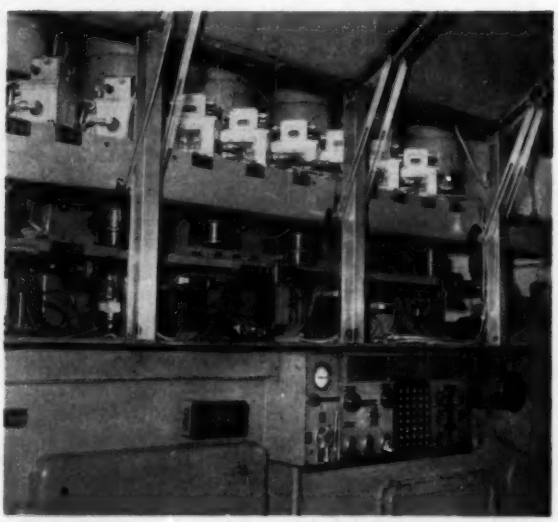
11 . . . Special centerless grinders for taper tracks



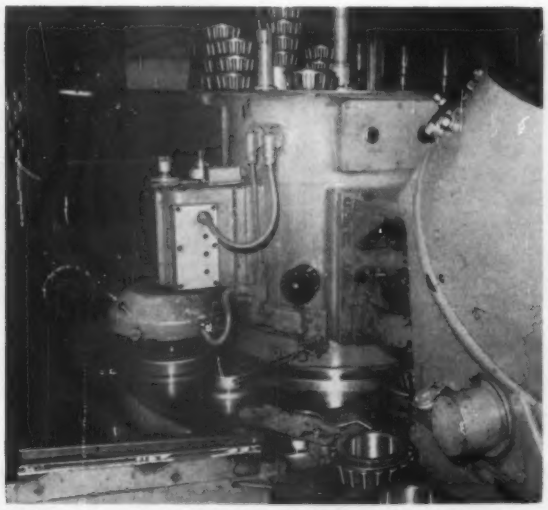
13 . . . Centerless internal race grinders



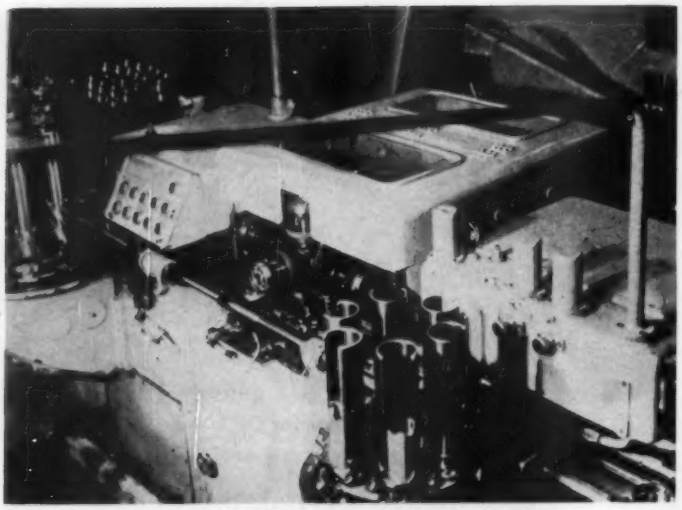
12 . . . Form-grinding OD on inner ball races



14 . . . Automatic inspection machine



15 . . . Automatic assembly of taper roller bearings



16 . . . Automatic assembly of ball bearings

such as the one shown in Fig 14, have a number of inspection heads in line, and the components pass through them on an in-line transfer principle. Gaging is pneumatic-electric. Bearings outside tolerance are indicated by warning signal lamps, and rejected rings are automatically separated out. Good components go to the assembly machines, while rejects are either corrected or scrapped.

The automatic assembly machine (v) for taper roller bearings (Fig 15) has four stations: (1) cages are taken from the magazine and placed automatically on a table fixture: rotary indexer then takes work to (2) where rollers drop into position in the separator and the inner ring is assembled, (3) a gaging head (see Fig 15) automatically inspects for correct number of rolls and rings and positioning, (4) cage is loaded and finished assembly is transferred to completed-bearing inspection units, after the outer ring is assembled.

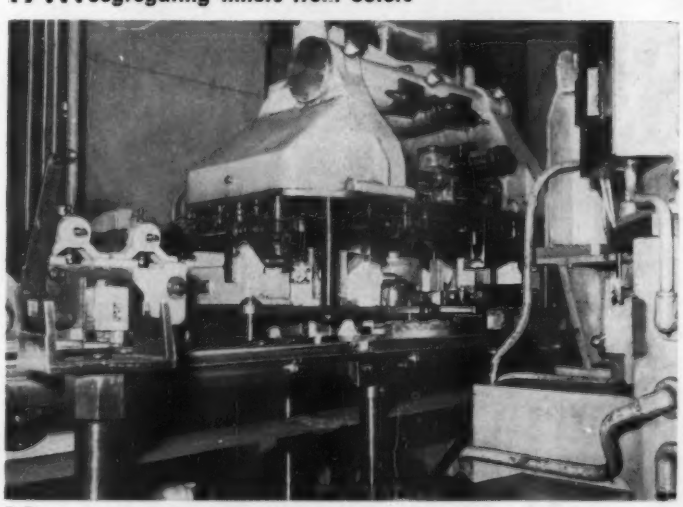
The ball bearing assembly unit is an integration of four machines—one that grades the rings (w), one that delivers the balls (x), one that assembles (y) and one that controls radial spacing (z). All four units are tied electronically and synchronized.

The unit that does the actual assembly works this way: (1) rings are delivered and the balls placed in the rings, (2) half the cage is assembled, and the balls radially spaced within it, (3) the second half of the cage is pressed into position, and (4) the completed assembly is checked for any absence of components.

After assembly, ball and roller bearings go through inspection machines, then through a unit that demagnetizes and removes the inners from the outers and channels them onto parallel tracks into an anti-corrosion-treatment unit (Fig 17). Then the bearing assemblies are cooled to 30 F with freon gas. This congeals greases or anti-corrosion compounds before water vapor can enter.

Last step (Fig 18): packing bearings automatically in paraffin paper—boxes are automatically made up from cardboard, bearings go into the boxes, which are sealed, labeled and transferred to a table where they are wooden-crated for dispatch.

17 . . . Segregating inners from outers



18 . . . Automatic packaging machine

Replacement and Depreciation

MAPI Finds Some Significant Shifts in Industry Practice

WASHINGTON—Almost one-third of the nation's capital goods manufacturers are depreciating their production equipment by the double-declining balance method, and another one-third by the sum-of-the-digits method, a survey just completed by the Machinery & Allied Products Institute reveals. Both methods, legalized by the Internal Revenue Code of 1954, enable purchasers of new equipment to write off their investments much faster than by use of the conventional straight-line method.

Regularized Replacement Grows

The survey shows that the long-time educational campaign on behalf of regularized replacement of old equipment, spearheaded by MAPI and actively supported by *American Machinist*, is having beneficial effects. Some 79% of the companies surveyed regularly review their equipment situation for the purpose of improvement and modernization, against only 35% in a 1948 MAPI survey. More than that, 54% of the companies have a staff man with special responsibility for preparing studies to determine the economic advantages of replacement (only 28% had such a person in 1948). And among the capital goods industries' customer firms, too, the hiring of replacement specialists has grown—15% since 1948.

Rule-of-Thumb On Way Out

While the short pay-off method still is the most popular device for determining replacement needs, a substantial number of companies reported the use of specific formulas rather than rule-of-thumb procedures. The pay-off period is employed by 42% of the companies participating in the survey—the MAPI formula by 19%.

Industry today is trending away from the practice of insisting that a new machine pay for itself over a very brief period, say three years or less, or it will not be bought. Some 62% of the surveyed companies say that the payoff time is now longer than three years, whereas in 1948 only 58% subscribed to that practice. Among customers of durable goods producers, the change since 1948 is even more pronounced. About 58% take more than three years as the pay-off period, against 26% in 1948. Nevertheless, the pay-off time still is only a small portion of the machine's normal service life.

Also reported by the survey:

Builder assistance to the customer in the financing of purchases has changed little between 1948 and 1956. Today's figures of 24% for installment selling, 11% for trade-ins, and 14% for rentals haven't changed significantly since 1948.

Some 296 capital good firms replied that this is where the initial recommendation on re-equipment outlay starts: superintendents, works managers or department heads 61%; engineers or master mechanics 14%; foremen 7%; top management 13%, others 5%.

Some 61% of the surveyed companies make up their preliminary capital budgets more than a year ahead.

More than 75% of the surveyed companies regularly forecast depreciation, sales, earnings, retained earnings, orders and backlog, and cash and working capital.

Asked "Do you regularly maintain the following records on a machine or facility unit basis?" 281 firms answered this way: repairs and maintenance—yes 73%, no 27%; machine hours worked—yes 38%, no 62%; spoilage—yes 23%, no 77%; downtime—yes 26%, no 74%; supplies—yes 23%, no 77%; tool costs—yes 29%, no 71%.

NEWS NOTE

So that you may have without delay the first exclusive detailed report on Russia's showpiece "automatic factory," we have given over to it most of the regular news pages in this issue, plus "Talking Shop." It begins on p147—The Editors

Also included in the MAPI questionnaire was a section on the external application of equipment methods and policies of builders:

Q. How high in the customer's management to do your salesmen, or dealer organizations usually have access? Of 275 firms, 70% said they reach general management.

Q. Do your salesmen know of many unused opportunities for profitable re-equipment in customer plants? Yes 59%. No 41%.

Q. To what extent is the customer's liquid current position a factor in his decision to buy or not to buy your product? It's the determining factor, or at least an important factor, 53% replied, while 47% said it's minor.

Q. In your direct selling, do you sell your product on an installment basis? Yes 24%, No 76%. *If so, do you usually sell the notes?* Yes 63%, No 37%. *If you sell them, is it with recourse?* Yes 34%. *Without recourse?* Yes 66%.

Q. Do you accept used equipment as part payment? Yes 11%, No 89%. *If so, do you accept equipment of other customers?* Yes 11%, No 89%.

Q. Do you lease your product to customers? Yes 14%, No 86%. *If yes, with a renewal option?* Yes 41%, No 59%. *With purchase option?* Yes 59%, No 41%. *With both?* Yes 31%, No 69%.

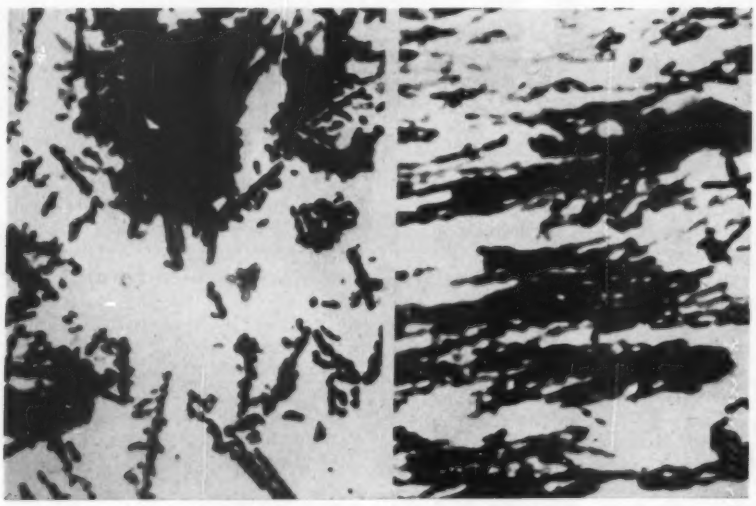
Q. Do you make a practice of renting equipment from others? Yes 7%, No 93%. *If yes, with a renewal option?* Yes 25%, No 75%. *With a purchase option?* Yes 19%, No 81%. *With both?* Yes 31%, No 69%.

Q. Do you think that your customers would be better mechanized if equipment were more available on a rental basis? Yes 8%, No 92%.

Q. Do you find that replacement decisions of your customers are influenced by the book value, or unrecovered cost, of the asset considered for retirement? Yes 22%, No 78%.

Q. Do your salesmen make equipment analysis studies for your customers? Yes 45%, No 55%.

Q. Do your large customers have in general a more scientific and progressive equipment policy than small one? Yes 86%, No 14%.



"Iron dust" magnified 50,000 times . . .
looks like this under an electron microscope. Each particle is a separate magnet—a billion billion to the pound. To achieve super-strength and versatility, GE researchers had to break up the magnetic log jam (left) and line up the particles in the manner shown at right

Unique magnet . . .
seen through magnifying glass is made up of 10 million billion sub-microscopic particles of ordinary iron—each one a magnet in itself

Billion-Billion-per-Lb Magnets

NEW YORK—Microscopic particles of "iron dust," each one a magnet in itself and each so small that a billion billion of them weigh only a pound, are opening new vistas in magnet applications. Still in the experimental stage at General Electric, the particles can be embedded in plastics, metal, rubber or glass. And they can be machined, drilled, tapped, soldered or molded to any precise shape.

No Strategic Metals Involved

No miracle alloys are involved—just plain iron. This means that strategic metals like cobalt and nickel need no longer be vital to the composition of most magnets. And it means the iron particle magnets can be used in nuclear reactors, where radioactivity would raise hob.

"Greatest Thing Since Alnico"

General Electric, which regards the magnetized iron particles as the greatest magnetic development since Alnico, claims the new process will result in smaller, lighter, more accurate and more rugged electric instruments, and that it will aid in the manufacture of improved photographic exposure meters, aircraft instruments and other products using permanent magnets.

Starting with a theoretical physicist's premise that ultra-fine elongated particles might have high resistance to demagnetization, Dr T O Paine, manager of GE Instrument Dept's Measurements Laboratory, and a team of researchers set out to elongate iron particles, which have a pronounced and pesky tendency to grow round. That meant controlling the shape of something finer than cigarette smoke, smaller than the wave length of light, invisible under most microscopes.

How It Was Done

This has been accomplished after long experimentation by creating an additional field at the sides of the particle, which increases resistance of the particle to demagnetization a hundred thousand times over that of ordinary iron, although the particle still retains the composition and crystal structure of ordinary iron. To make the particles into a magnet, they are aligned by a powerful magnetic field, then compacted together under great pressure with a suitable binder, which can be metal, plastic, glass or rubber.

Under the electron microscope, GE scientists have found that structures so produced have magnetic strengths equal to those of the strongest commercial magnetic alloys, and that the magnetic and mechanical properties of such structures can be precisely controlled—to such an extent that not only can the properties of available magnets be duplicated, but characteristics previously believed unattainable can be achieved.

Just One Research Step

GE's research team regards the iron particle magnet as only a continuing step in its search for ways to make magnets of undreamed-of power. As Edwin E Parker, general manager of GE's Instrument Department, West Lynn, Mass, told newsmen, "Although it will be quite some time before the new magnets will be commercially available in quantity—the demand will exceed supply for a time—the door is now open to new magnet applications as significant as those that followed Alnico. We have already produced experimental magnets equal to the strongest commercial magnets now available. And we believe that we can make them 10 times stronger."

U S Writes Finis to Fast Writeoffs

WASHINGTON—Tax paid to stimulate investment in needed plant and equipment is over—except for a few items needed directly by the military. That's the nub of an administration decision announced by Defense Mobilization Director Arthur S Flemming.

Flemming, after conferring with the President and the Cabinet-level Defense Mobilization Board, said: (1) no new plants or facilities will be eligible for so-called certificates of necessity, which allow part of their cost to be amortized for tax purposes at a fast five-year rate—unless a defense mobilization expansion goal is still open for a particular item; (2) no new goals will be set, and old goals will not be reopened; (3) civilian allocation controls will not be broadened beyond the current system of giving so-called defense rated order for direct military contract supplies a production and delivery priority.

Only 17 Goals Remain

Of the 200-odd goals for production capacity eligible for rapid tax amortization originally set (first during World War II, revived during the Korean fighting), only 17 remain open—or, in other words, only 17 materials are below the production capacity Washington feels is essential for emergency military requirements. They are:

Chemical grade chromite, better and chemical grade manganese, medical supplies and equipment, mercury, nickel, roll-on roll-off ships, selenium, steam boilers, steam turbines, steel castings, substitutes for strategic mica, ocean-going tankers, research and development laboratories, oil and gas pipelines and petroleum storage facilities for defense programs, power and production facilities for defense and atomic energy commission programs, and scientific instruments.

All other goals, including pending goals which were filled but not closed—taconite iron ore, alkylate, heavy steel plates, commercial aircraft, titanium melting and processing facilities—are suspended.

Most hopeful of getting its goals reopened or expanded was the steel industry, facing a racing demand particularly for: (1) steel plates for tankers, as a result of the Suez crisis; (2) structural shapes and forms for the government supported building industry boom; and (3) tubular goods for oil pipelines, also a result of Suez troubles.

Won't Stop Steel Expansion

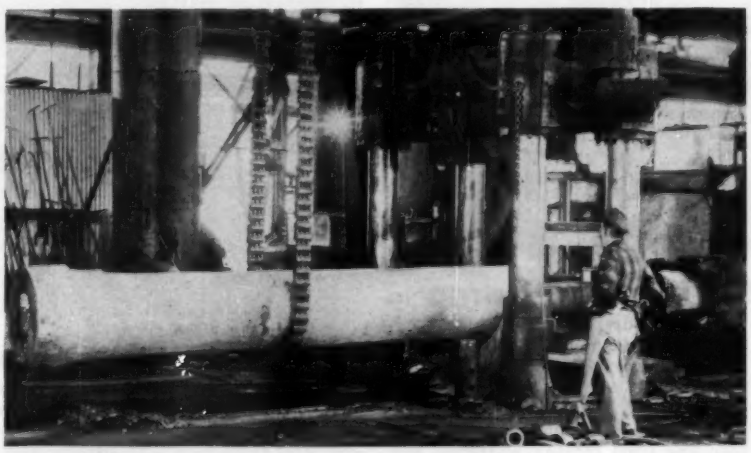
Despite the tax-aid turndown, steel is expected to go ahead with a record expansion program of more than $3 billion over the next three years. The new plant and facilities planned may simply take a little longer, and cost a little more to build. This means steel will have to find another way of getting its financing together—price boosts are the best bet. Also, steel may get customer loans, float stock or split its current shares, or try to borrow more money for expansion. Already some price increases of 3-5% on so-called extras have been announced.

Steel has said for some time that the 1954 tax law, which allows writeoffs of two-thirds in half the life of an item—a sort of half-fast tax write-off compromise—is not working out to be sufficient to stimulate enough expansion. The industry may make some efforts to get Congress to liberalize the provisions of the new law. But this is regarded as a slim hope at best. At least two Congressional committees are investigating industry collusion in setting prices, and have asked steel company people to testify. Steel isn't anxious to arouse Congress further. Indeed, the coming Congress is in no mood to liberalize tax laws—to the contrary, it may tighten them somewhat.

Indicating the mood of Congress with respect to taxes, Senator Harry Byrd (D-Va), powerful chairman of the Senate-Finance Committee, issued a report New Year's Eve on hearings his Committee held last summer on the very matter of fast amortization. Byrd's report, as expected, took the same line as Secretary Humphrey—that no new tax relief ought to be granted for anything but military needs.

Treasury's Stand

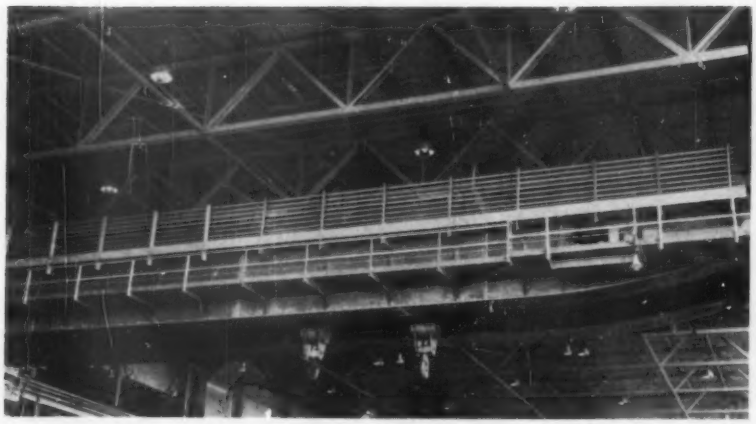
Treasury Secretary George Humphrey is tagged as the main obstacle to new tax help. He, backed by Flemming, strongly believes that (1) tax amortization should be reserved for strictly military demand, (2) that the military now has enough steel on tap or available to meet any emergency. Civilian markets, such as durable consumer goods, also booming, must take a back seat, be cut back should war come.



Record mandrel forging

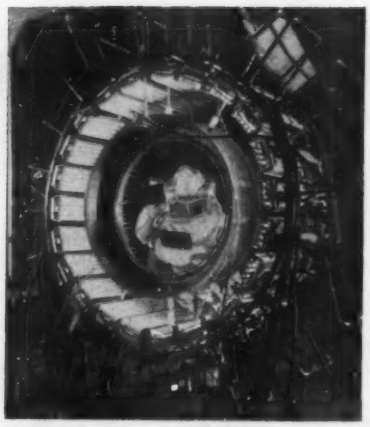
DESIGNED TO BECOME A SCRAP BALER RAM, this huge forging, biggest ever turned out at National Supply Co's Torrance, Calif, plant is more than 16 ft long, has a 28.5 in. dia, with 33 in. dia at upset end, a 6-in. wall, and weighs 26,700 lb. Special mandrel was used

NEWS REPORT ...in pictures



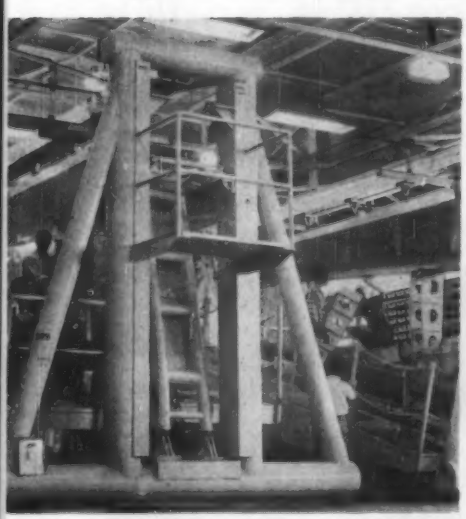
First All-Aluminum Crane

. . . installed at Kaiser Aluminum & Chemical Corp's rolling mill at Ravenswood, W Va, has 100-ton capacity, 105-ft span, two 50-ton capacity hooks. Built from Kaiser Aluminum's high-strength, weldable alloy 5083 by Cleveland Crane & Engineering Co, the crane costs somewhere between 3 and 8% more than a comparable steel one but its lightness makes up for the initial cost by cutting building costs, freight and installation charges (no painting is required for one thing) and decreasing wheel loads and vibration



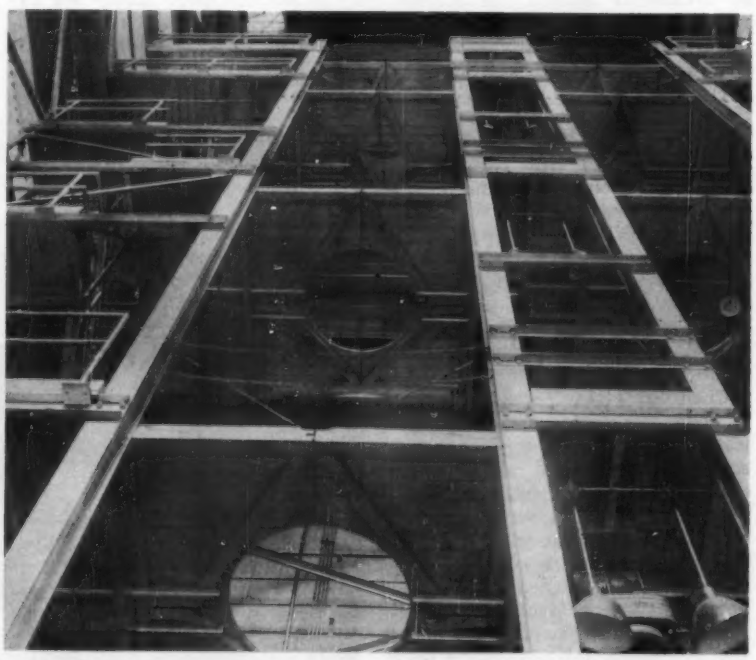
Hot-Cold Stress

Torturing a metal ring simulating part of an aircraft fuselage is done at North American Aviation by simultaneously heating the outside to 450 F while cooling the inside to 90 F. Resulting stress aids researchers to probe the thermal barrier



Pushbutton Ramp

Push of a button raises or lowers assembly workers to desired work height in production of Stratotanker assemblies at Rohr Aircraft, Riverside, Calif. Developed at Rohr, the ramps eliminate clutter, confusion and lost time resulting from moving platforms and erecting scaffolding for large jigs. And they make it possible to locate assembly jigs side by side—consolidating production steps—to keep all tools near at hand, and to save tremendously on assembly floor space



Earth Satellite Check-out Tool

This is an interior view, looking up, of a vertical test and check-out tool developed by the Martin Co, Baltimore, prime contractor on Project Vanguard, for simultaneous assembly and check-out of two earth satellites. Built of structural steel and reinforced concrete, the tool has five floor working levels, the top one 64 ft above ground. Fold boards on each level allow for entry of the vehicle, and the entire structure can be disassembled and erected at another site. The tool is supplied with light, heat and water, electric power and water drainage. A precisely controlled 2-ton crane takes care of alignment of the three stages of the vehicle. Aside from assembly, tool's chief purpose is to simulate static firing of the vehicle

A D Moncrieff has been elected a vice president of Michigan Tool Co. Formerly manufacturing manager of the Machine Tool and Cutting Tool Division, he will manage the company's five-plant Machine and Tool Division

John P Poth has joined The Bullard Co as director of engineering. He was formerly vice president, engineering, at Engineering & Research Corp, Riverdale, Md

Paul N Stanton has been named sales manager of Lapointe Machine Tool Co, Hudson, Mass. He will be directly responsible to Joseph P Crosby, vice president, sales

Names in the News . . .

Charles L Holbert, executive vice president of H K Porter Co, has been elected president. He succeeds **T M Evans,** named board chairman.

Raymond A Rich, formerly a vice president of Philco Corp, has been elected president of Avco Manufacturing Corp.

Edward J Mytkowicz has been named manager of operations for the Jones Machinery Division of Hewitt-Robins. He has been serving as manager of manufacturing at H-R's Passaic, NJ, plant.

Joseph F Quaas has been appointed vice president in charge of manufacturing and production for Eutectic Welding Alloys Corp, New York.

Thomas M Rees, formerly president of the Rees Machinery Co, Pittsburgh, is now affiliated with the Stanley Berg Machinery Co. He will handle sales of heavy machinery in the Pittsburgh and tri-state area.

J D Kelsey, assistant to the president of Standard Railway Equipment Manufacturing Co, Chicago, has been elected a vice president.

Byron C Booth has been elected president of the George W Borg Corp, Delavan, Wis. Mr Booth, formerly president of Borg Equipment Division, succeeds **George W Borg. Ralph A Ackerman,** formerly production manager, has been promoted to division manager.

Carl F Herbold and **Ralph J Eschborn** have been named vice presidents of Jack & Heintz, Cleveland manufacturer of electric systems for aircraft and missiles. Formerly assistant to the president, Mr Herbold will direct manufacturing operations; Mr Eschborn, formerly chief engineer will be responsible for engineering activities.

Ralph K Mangan, president and general manager of the Buda Division of Allis-Chalmers Manufacturing Co, has retired after 40 years with the company. **L C Daniels** succeeds Mr Mangan as general manager of the division; **Owen J Higgins** has been named general manager of the Harvey works.

Robert E Ward has been appointed director of manufacturing of New York Air Brake Co. He was formerly manager of special services at Bendix Aviation Corp

Guy T Avery has been elected president and chief administrative officer of Acme Steel Co. Formerly executive vice president, he succeeds **Frederick M Gillies,** named board chairman and chief executive officer.

Edmund J Lomazzo, formerly associated with Hydra-Feed Machine Tool Corp, has been named assistant chief engineer of The Bullard Co. Bullard recently acquired Hydra-Feed's lathe line.

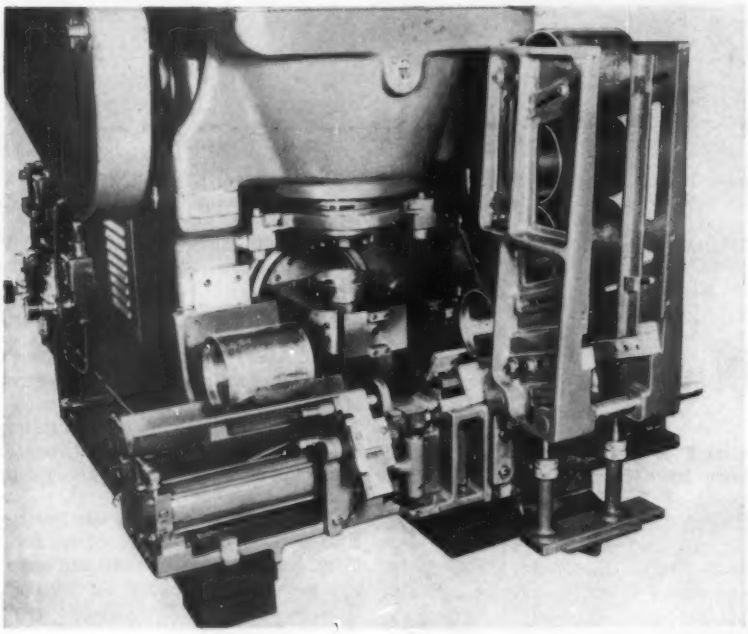
Ervin F Borisch, executive vice president of Milwaukee Gear Co, has been appointed treasurer of American Gear Manufacturers Association. He will complete the term of **T A Jones** who has resigned as general manager of Jones Machinery Division, Hewitt-Robins, Inc.

Dr Bela K Erdoss has been named president of the Korfund Co, Long Island City, NY, manufacturer of vibration, shock, and noise control products. Dr Erdoss, who is also president of Cork Foundation Co, and Korfund Co (Canada) Ltd, succeeds Siegfried Rosenzweig, who organized Korfund in 1923.

William F Boyd has been elected vice president, manufacturing, for Kellogg Switchboard & Supply Co. He was previously director of industrial relations.

Alfred J Olson has been named general sales manager for the Chicago plant of Joseph T Ryerson & Son, Inc. His former post as sales manager will be filled by **Robert A Daggit** and **Scott Vrooman,** former assistant sales managers.

New Shop Equipment



Landis Automatic Coupling Tapper Features Pneumatic Operation

No. 48T coupling tapping machine is designed for the high-production, precision internal threading of oil tubular goods ranging from 1¼-in.-OD upset tubing to 6-in.-OD casing. Pneumatically operated and electrically controlled, it features automatic operation with magazine feed. Production rates at 100% efficiency range from 96 per hr on 1½-in. pipe couplings to 17 per hr for 5½-in. casing couplings.

When machine cycle starts, a transfer mechanism moves the coupling from the bottom of the magazine along slide plates into the chuck. Correct workpiece positioning in chuck is assured by an automatic workstop. The grips close and the chuck cylinder moves rearward from the loading position to the tapping area. It then indexes 90° to bring the coupling into tapping position for the first end. By engagement of a lock bolt, the chuck cylinder is positively locked into position for tapping.

The spindle and tap-head unit drops rapidly to perform the threading operation, but is decelerated by a hydrocheck just prior to contacting the coupling. Now the leadscrew nuts engage, the tap trip-ring contacts the coupling face, and coolant is supplied. Simultaneously the tap head enters work to produce the thread at a pitch rate determined by machine's leadscrew.

During threading, the trip-ring and collapsing-collar unit is arrested by the coupling face and revolves in abutment with it. Meanwhile the tap-spindle combination passes through the collapsing collar, actuating its chaser-receding mechanism (which controls thread taper). Tap collapsing occurs as the trip plunger in the tap body is depressed upon contacting an adjustable thread-length bar in the collapsing collar.

Tap-collapsing action opens the leadscrew nuts, the coolant flow stops, and the spindle is rapidly returned to its uppermost position. With this upward movement, the tap expands. The lock bolt which holds the chuck cylinder in tapping position is disengaged and the cylinder is indexed 180°. The lock bolt re-engages and the opposite end of the coupling is tapped as described above. After completion of second cut, chuck indexes 90°, completed part is expelled, and new part is loaded.

Other features of the machine: variable spindle float; receding chaser-tap mechanism to assure threads of a precision taper with infinite settings from ¾- to 0-in.-taper per ft; detachable tap heads for wide-range coverage with minimum tooling cost; and precision worm-and wormwheel drive.

Landis Machine Co, Waynesboro, Penna

Rotex Turret Punch Offered In Air-Powered Model

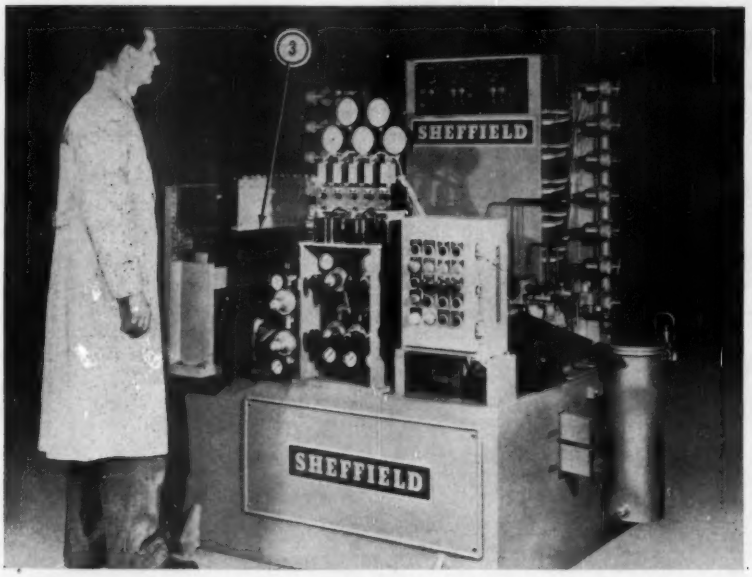
Model 18-AH power-operated turret punch is reportedly capable of punching a 2-in. hole in 12-gage mild steel or in 14-gage stainless steel. It supplies 18 stations ranging from 5/32 in. to 2 in., with the smaller sizes capable of punching heavier-gage metal.

Company can furnish odd-shaped punch and die sets, including square, rectangular, tube-socket, and others for punching panels.

Other features: foot control can be moved to any position operator wants; self-loading oiling system is included.

Rotex Punch Co, 2350 Alvarado St, San Leandro, Calif

Materials and Parts . . .



Automatic Gaging, Feedback Controls Are Combined in Sheffield Unit

A device called Multi-Feedbak has been developed by the Autometrology Div of Sheffield Corp which combines multiple automatic gaging and feedback machine control in a single unit. The unit is designed to overcome the costly problem of adapting individual size and machine-control-units with feedback at each machine to achieve precise, high-speed measurement of parts being produced by a series of machines.

System consists of a set of gage tooling and provisions for receiving and measuring precision parts from each of a series of machines. Individual parts are conveyed through the automatic gaging control system by a series of parts-handling devices. A "memory system" (shown in illustration by numeral 3) positions incoming parts into gaging stations, one at a time, as they flow from the different machines.

Controls go into instant action as each part is inspected. Electrical gage signals received from the parts are transmitted to the particular machine that produced the part. These signals, flashing on a small panel located at each machine, can then be used to stop or correct the machine if it begins producing a predetermined number of reject parts. These signals anticipate and correct by "loop feedback size control," or a combination of both.

Where all parts passing through the gaging control unit are not quite the same, two gaging stations are incorporated into the device. If basic dimensions are the same but overall sizes are different, a primary gage station inspects the basic dimensions and a series of secondary stations inspects the variable dimensions of the part. Here the "memory system" performs the additional job of determining which secondary gage station will inspect the part after it leaves the primary station. The memory system may also be used for a third dimensional-quality control function—that of segregating acceptable parts into individual lanes or chutes corresponding to the various types of parts to be produced.

Company reports that Multi-Feedbak installations controlling 20 machines simultaneously are in use.

Sheffield Corp, Autometrology Div, Dayton 1, Ohio

...including

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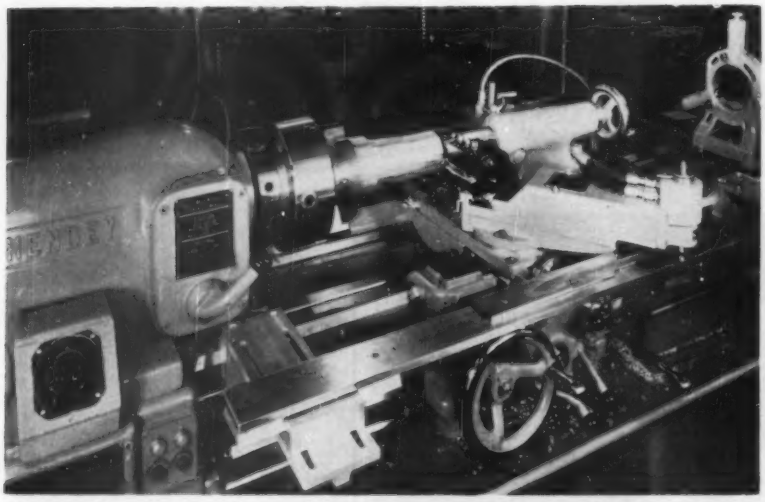


Hendey Hydraulic Tracer Attachment Adapts Lathe to Production Jobs

Hydraulic tracer attachment, designed for use on company's No. 2E general-purpose lathe, provides a production machine for turning jobs. Machine can be reconverted to general lathe service simply by removing the hydraulic tracer control and templet-mounting brackets. Tracer unit comes as a complete package, with the pump and sump mounted on the floor at the rear of the machine, so that there are no additional external connections.

Tracer attachment replaces the standard compound and is held in place by two bolts. Two additional bolts hold down the templet-holding bracket.

A flat templet mounted at the front of the machine is used for all production turning operations. Use of the templet, together with the lathe's infinitely variable electronic drive from 15 to 1500 rpm, is said to assure smooth finishes and to reduce or eliminate need for second-operation finish turning.

Hendey Machine Div, Barber-Colman Co, Rockford, Ill

Clearing Safety Device Prevents Press from Repeating

Saf-Strok control is a safety device designed to prevent a press from repeating, where the slide continues to stroke even though the run buttons have not been depressed. Device is an addition to normal press operating controls and may be installed on presses now in operation.

Key device in this safety circuit is a limit switch that is activated if the press crankshaft accidentally goes beyond its normal stopping point; switch is usually set so that 5 to 10° of crankshaft overtravel will actuate the switch and stop the press.

Actual stopping of press is accomplished through two 3-way solenoid valves, which are normally open and do not affect press movement. When crankshaft overtravel occurs, both valve coils are energized, the valves close, and clutch and brake are immediately exhausted of air. This sequence causes clutch to disengage and brake to engage, so that press slide stops. Once the valves have been energized, a red indicating light goes on and the press cannot be operated until a button is pressed which will open the safety valves.

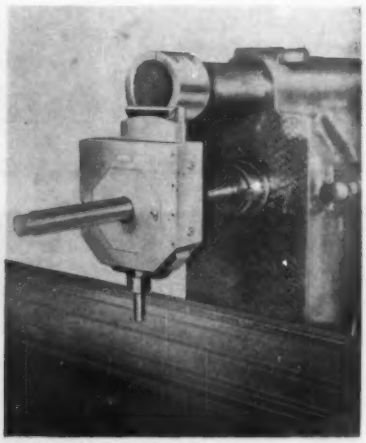
A test button is installed which when depressed by-passes the press limit switch and causes a deliberate failure; use of test button assures that safety device is in good working order.

Clearing Machine Corp, 6499 W 65th St, Chicago 3, Ill

Citco Diamond Dresser Offered in Several Sizes

Diamond dresser, the Citco Turnit, can be turned with ordinary hand wrench, eliminating removal of diamond tool. Frequent turning is said to lengthen diamond life, keep it sharper. Tool has hardened and ground steel shank, beryllium copper head; shank diameters are ¼, ⅜, and 7/16 in.

Cleveland Industrial Tool Co, Skaneateles, N Y



Miller Becomes Shaper With Dorden Attachment

Horizontal milling machine can be changed into a vertical shaper with attachment called Mill-Shape. Attachment fits directly on any regular horizontal milling machine arbor, close to the mill frame or as far out as the arbor will permit.

Attachment is made in two models: MS-1 has non-adjustable 2½-in. stroke and no-swivel features, and is priced at $285. Model MS-2 has adjustable stroke up to 3 in.; this model swivels in two directions for taper shaping and is priced at $395.

Dorden & Co, 18750 Fitzpatrick Ave, Detroit 28, Mich

ELECTRONIC INTERNAL CALIBRATING MASTER is adjustable over a range from 5 to 36 in. and is available with dual electronic amplification of 1000/2000, 2500/5000, 5000/10,000, or 10,000/20,000 to 1. Company's Accutron electronic amplifier is used; gage operates on 110-v 60-c ac. Gage is supplied as kit, and includes gage handle with transducer pickup cartridge, 6 length bars ranging from 1 to 8 in. long, and the amplifier—*Sheffield Corp, Dayton 1, Ohio*

FYI
FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 CYLINDRICAL GRINDING MACHINES—*Landis Tool Co, Waynesboro, Penna.* 28-page condensed general catalog CG-56 contains illustrated descriptions and specifications of standard and special purpose precision units.

2 AUTOMATIC MULTIPLE TRANSFER PRESSES—*Baird Machine Co, Stratford, Conn.* 12-page illustrated bulletin lists latest developments in line; details basic principles of operation. Tooling and production rates on variety of typical jobs discussed; specifications on eight basic sizes given.

3 CARBIDE TOOL AND CHIP BREAKER GRINDERS—*Hammond Machinery Builders, Inc, 1618 Douglas Ave, Kalamazoo, Mich.* 16-page catalog 260 pictures and describes features of electrolytic grinders using silicon carbide and diamond wheels. Specifications provided for five machines.

4 UNIVERSAL TESTING MACHINES—*Tinius Olsen Testing Machine Co, Dept 5781, Easton Rd, Willow Grove, Penna.* 40-page bulletin 54 covers complete line of Electomatics from 500 to 1-million-lb capacity. Also contains data on compression and XY testing machines, electronic recorders, instrumentation, and accessories.

5 SWISS HIGH PRECISION MACHINE TOOLS — *Carl Hirschmann Co, Manhasset, NY.* 12-page illustrated catalog provides information on Tornos Automatics, Kummer dual head lathe, Hauser jig borers, jig grinders and pivot burnishers, Schaublin lathes and milling machines, Walter cutter grinders.

6 GEAR SHAVING MACHINE—*National Broach & Machine Co, 5600 St Jean, Detroit 13, Mich.* 12-page bulletin S-56-1 gives details on Model GCI for conventional shaving. Operating principle described, features illustrated, specifications included.

7 POWER TOOLS—*Boice-Crane Co, 985 W Central Ave, Toledo 6, Ohio.* 52-page catalog 57 illustrates and describes units for cutting, shaping, drilling, and finishing metal, plastics, or wood. Details and specifications on band and contour saws, band filers, cutters, shapers, drillpresses, tool and knife grinders, sanders, jointers, shapers, and spinning tools.

TOOLS AND ACCESSORIES

8 GEAR SHAVING CUTTERS—*National Broach & Machine Co, 5600 St Jean Ave, Detroit 13, Mich.* 12-page illustrated reference manual CR. 56-10 discusses care and use of cutters. Includes specification tables; mounting instructions and data on speeds, feeds, coolant, cutter life, sharpening, storage, and cutter repair procedures.

9 CARBOLOY CARBIDE BLANKS—*General Electric Co, Metallurgical Products Dept, Detroit 32, Mich.* 35-page price list GT-314 covers semi and modified standard cemented carbide blanks as well as solid cemented carbide cylinders; ordering instructions included.

10 ELECTRON MICROSCOPE—*North American Philips Co, Instruments Div, 750 S Fulton Ave, Mount Vernon, NY.* 12-page illustrated brochure gives complete data on construction and operation. Features and accessories described.

11 SILICONE LUBRICANTS — *Dow Corning Corp, Midland, Mich.* 8-page bulletin 6-101 discusses properties and performance of various silicone oils, greases, and compounds; typical applications listed and illustrated.

12 THROW-AWAY TOOLING—*Weston Co, 1220 Woodward Heights Blvd, Ferndale 20, Mich.* Technical bulletins 896-1 and 2 contain data on latest additions to "no-grind" line. Tools covered are basically 30° and 45° chamfering tools. Specifications of sizes available, typical applications illustrated.

13 MECHANICAL FORCE GAGES—*Hunter Spring Co, Apparatus Div, 1 Spring Ave, Lansdale, Penna.* 6-page bul-

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letin 750c gives illustrated description and specifications for line of 18 precision, direct-reading gages for measuring both tension and compression loads up to a max of 200 lb. Performance data and applications included.

HEAT TREATING AND WELDING

14 BRAZING ALLOYS—*Handy & Harman, 82 Fulton St, New York 38, NY.* 4-page bulletin 22 contains data on four Hi-Temp alloys for high-strength bonding. Properties of each described, applications illustrated, steps outlined for effective brazing.

15 HEAT TREATING PROCESS—*Armor-Tuf Sales Corp, 299 Madison Ave, New York, NY.* Illustrated circular describes simplified process of heat treating tools and steel parts through use of Armor-Tuf steel hardening compound.

16 PRODUCTION FURNACES—*Lindberg Industrial Corp, 2231 W Hubbard St, Chicago 12, Ill.* 4-page bulletin covers large-size units for all forms of metal heat treating, also for continuous enameling, aluminum melting, and ceramic requirements. Installations illustrated.

PLANT SERVICE EQUIPMENT

17 BRUSHES, BRUSHING MACHINES —*Osborn Manufacturing Co, 5401 Hamilton Ave, Cleveland, Ohio.* 100-page spiral-bound, illustrated catalog contains detailed information on Brushamatic machines, power brushes, paint, varnish, and maintenance brushes. Selection and application data included.

18 CENTRIFUGAL FANS — *Chicago Blower Corp, 9363 Pacific Ave, Franklin Park, Ill.* 60-page bulletin C-103 pictures and describes line of backward curved blade units with wheel diameters from 13-7/32 to 168 in.

19 RUST PREVENTIVE—*Valvoline Oil Co, Freedom, Penna.* 14-page illustrated booklet describes Valvoline Tectyl preventives, petroleum-type coatings applied to operating or functional metal parts. Sections cover rust problems, cleaning the product, materials in corrosion preventives, selection data. Additional charts included cover products in detail; suggested application and special data on each included.

PARTS AND MATERIALS

20 POWDERED METAL PARTS—*Lux Clock Manufacturing Co, Powdered Metal Parts Div, 100 Johnson St, Waterbury, Conn.* 12-page illustrated brochure discusses advantages, case histories, secondary and finishing operations. Chart outlines various standards, specifications and references.

21 PRECISION SWITCHES — *Micro Switch, Division of Minneapolis-Honeywell Regulator Co, Freeport, Ill.* 8-page bulletin contains information on heavy-duty precision switches for machine tools and other industrial equipment. Several series detailed; features discussed, engineering data included.

22 PHENOLIC PRODUCTS — *General Electric Co, Chemical Materials Dept, 1 Plastics Ave, Pittsfield, Mass.* 12-page illustrated brochure CDC-322 covers line of phenolic molding materials and resins. Includes technical data, special properties, and product features.

23 SPRAG CLUTCHES—*Formsprag Co, 23601 Hoover Rd, Van Dyke, Mich.* 26-page catalog 104-C provides information on clutches for overrunning, indexing, and backstopping applications. Ranges of applications illustrated and described; engineering data, dimensions, installation and maintenance, typical mounting arrangements covered.

24 CUTTING MATERIAL—*Newcomer Products, Inc, Latrobe, Penna.* Bulletin describes NewMet, designed to cut most materials at speeds of 1000 sfpm. Material is currently available in throw-away triangular, square, and round inserts, and solid cylinders.

25 ALUMINUM—*Joseph T Ryerson & Son, Box 484, Jersey City 3, NJ.* 16-page bulletin lists sizes and weights of rod, bar, sheet, coil, plate, tubular, and building products carried in stock. Selection guide data on cutting facilities, finishes, and mechanical properties included.

26 STEEL SPRINGS—*Alco Products, Inc, PO Box 1065, Schenectady 5, NY.* 16-page illustrated bulletin covers hot and cold-wound steel springs. Contains formulas and specifications for helical extension springs, and volute and Belleville disk springs. Design recommendations and chart listing physical properties for calculating springs in 22 materials included.

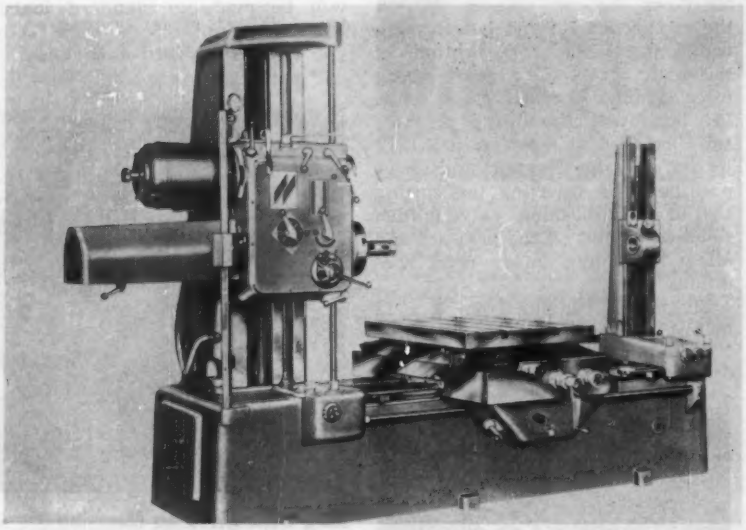
27 STAINLESS CASTINGS—*Allegheny Ludlum Steel Corp, 2020 Oliver Bldg, Pittsburgh 22, Penna.* 28-page booklet gives detailed information on corrosion-and-heat resisting stainless steel castings. Technical data section covers physical properties and chemical composition-standard analysis.

28 WIRE AND STRIP WEIGHT CALCULATOR — *National-Standard Co, Niles, Mich.* Circular slide-rule type plastic calculator determines weight of springs made from given sizes of round wire or flat stock. Scales are designed for steel, and conversion factors are given for aluminum, brass, copper, Monel, phosphor, bronze, and stainless.

29 TEMPLET DRILL BUSHINGS—*Penn Engineering & Manufacturing Co, Doylestown, Penna.* 12-page illustrated catalog gives data on self-clinching bushings. Four types (blank sizes) offered for all drill sizes from No. 55 to ½ in. inclusive. Installation procedure and engineering data included.

30 SILICONE PRODUCTS—*Dow Corning Corp, Midland, Mich.* 12-page illustrated 1957 Reference Guide describes 150 products grouped by usage. Charts, tables, and graphs compare various silicones with materials they are displacing.

31 COLD HEADED FASTENERS—*John Hassall, Inc, PO Box 2246, Westbury, LI, NY.* 4-page illustrated catalog covers design and manufacturing advantages of fasteners and parts.



Italian Horizontal Boring Machine Offered for General Shop Use

Horizontal boring machine, a 3-in. unit made in Italy, is trademarked Supermill. Machine is a close-tolerance, multi-purpose unit designed for general work in toolroom and production shops.

Machine features a facing head, jib-crane mounted, which swings away to the rear when not in use and need never be removed. Headstock spindle is free to pass through the facing head, so that machine may be used for facing and boring simultaneously.

Standard machine has 18 feeds and 16 speeds, with all change gearing for obtaining spindles feeds and speeds enclosed in the headstock. Height from spindle to table is 31 in., and crosstravel of table is 40 in. Distance from spindle to outboard support is 72 in.

Swingaway facing head has 11 separate power feeds in either direction, ranging from 0.001 to 0.165 ipr of head. Toolholder has a travel of 7¼ in.

The 3-in. machine is one of a family of boring machines of various capacities between 2 and 4 in. Special machines are available in all bed lengths, travels, and capacities.

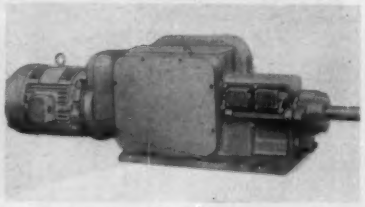
Imported by S & S Machinery Co, 140 53rd St, Brooklyn 32, NY

"Fatigue-Proof" Steel Bars Available for Test Purposes

Manufacturers now making parts which require tensile strengths in the range of 140,000 to 150,000 psi from either hot rolled or cold finished carbon or alloy bars may apply for a sample bar on a no-charge basis. Material is made by a new process which reportedly provides improved properties equal to or better than heat treated materials; manufacturer states that it machines 25% faster than annealed alloys, 50% faster than heat-treated alloys.

Those interested may send application details direct to La Salle's Sales Planning Dept. If, after consideration of the application, company engineers feel that the steel can be used to improve product quality or reduce per-unit costs, sample bar will be shipped.

La Salle Steel Co, 1412-150th St, Hammond, Ind



Cam-Feed Drilling Unit Added to Millholland Line

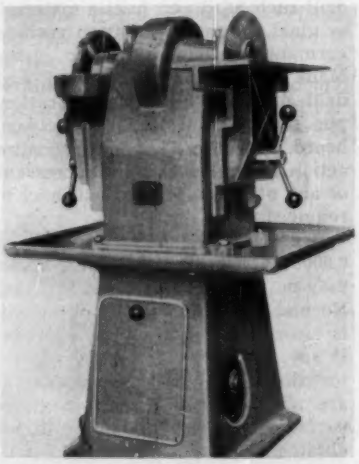
No. 4000 Series cam-feed drilling unit added to company's line retains plate cam in design. Cam, together with built-in air counterbalance, is said to give up to 85% of cam surface devoted to metal removal.

Enclosed unit is lubricated by a Micro-Fog system which eliminates oil seals on all rotating shafts and permits unit to be mounted in any position. For 8 hr of operation, only ¼ pint of oil is required.

Solid cam roller-follower on the spindle quill moves in a straight line in a hardened track; cam leads can be faithfully reproduced in spindle-carrier movement. Clutch and de-clutching have been simplified by use of an air solenoid-operated feed clutch; clutch can be set to disengage at any desired feeding pressure, so that tool is not forced. A single tool may be used in the spindle or a multiple head may be attached to spindle carrier. Motor drive is through gearing to the spindle.

Specifications: motor horsepower, ¾ to 5; max thrust, 1800 lb; max length of stroke, 6 in.; spindle speeds, 95 to 4000 rpm; capacity in steel, 1½ in.

W K Millholland Machinery Co, 6402 Westfield Blvd, Indianapolis 20, Ind



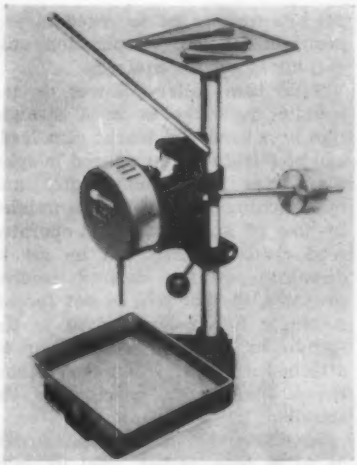
Jemco Disk Filing Machine

For quick removal of metal—ferrous and non-ferrous—wood, and plastics, disk filing machine may be equipped with two disks at one time ranging in size from 3⅛ to 12 in. Filing disks are available in many different cuts suitable for the type of work to be performed.

For cutting non-ferrous metals, disks are offered in carbon steel. For ferrous metals, disks of HSS or carbide can be provided. Teeth may be re-sharpened by grinding when dull.

Machine is powered by a 1-hp motor which turns disks at 5 standard speeds: 175, 250, 310, 370, and 410 rpm. Over-all dimensions are 32 in. high by 28 in. wide. Weight is 510 lb.

Jersey Mfg Co, 407 Livingston St, Elizabeth, NJ



Mullard Ultrasonic Drill Cuts Wide Variety of Materials

Ultrasonic equipment consisting of a 50-watt ultrasonic generator, a drill head, and a drill stand is designed to drill such hard and brittle materials as glass, ceramics, tungsten carbide, germanium, and synthetic gems. Made in England by Mullard, Ltd, drill operates at 20,000 vibrations per sec, so that it can barely be heard. Because of its reciprocating action it can shape square, crescent, or any other shape hole that may be required.

Drill will cut holes ranging from 0.0006 to ⅜-in. across. Thin blades may be used for slitting and cutting. Normal maximum depth obtainable is ½ in.; this depth may be exceeded if special stubs are employed. Dimensional accuracies of 0.0005 in. are possible on finishing cuts, and surface finishes of 8 to 10 mu-in. are obtained.

Abrasive used is a watery slurry of such materials as silicon carbide or boron carbide; material being machined determines type of abrasive used.

Distributed by Acoustica Associates, Inc, Glenwood Landing, LI, NY

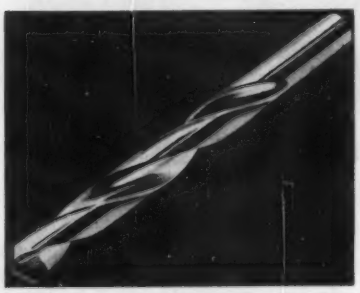
Floating Plate Facilitates Drill Jig Moving

Using the principle of a flat air bearing, the Centerline Floating Plate is designed to carry a relatively heavy weight and slide it along a flat, horizontal surface. Its major application is for moving a heavy drill jig from spindle to spindle on the table of a multiple-spindle drillpress.

Device contains a normally closed pushbutton valve which is connected to the shop air line by a length of hose. When the valve is depressed, air flows through passages within the cast-iron plate and out through connecting ports in the bottom of the plate, exerting a great lifting force against the drillpress table. Lift is a few thousandths of an inch, sufficient to float the plate and drill jig on a cushion of air until it is positioned by inserting the cutting tool in its jig bushing. Valve is then released to shut off the pressure and allow machining under rigid conditions.

Six plates, ranging from 9 x 12 in. to 15 x 24 in. in size, are available.

Centerline Engineering Co, 90 Crest St, Wethersfield, Conn

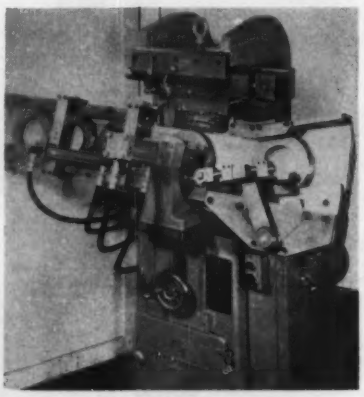


Drills for Cast Iron Are Carbide Tipped

Series 333 are made with a special fluting, heavy web, and slow spiral to provide greater strength and rigidity.

Drills are stocked by 64ths in the ⅛ to ½-in.-dia range, and they will be made to standard jobber lengths.

Ace Drill Corp, Adrian, Mich

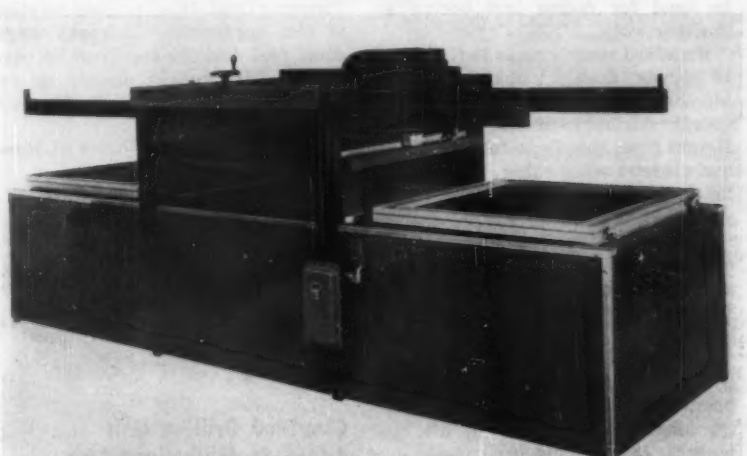


Ring Gear Marking Machine Is Completely Automatic

Model 175-S marks on the periphery of ring gear blanks. Parts are rolled into feed chute at right of machine from preceding operation, from which they are guided into position at marking station. After marking, gear is engaged by hydraulic arm that carries it to discharge chute at left.

Entire operation is automatic, requiring no operator. Serial numbering, fixed lettering, or both can be incorporated in the marking tool.

Geo T Schmidt, Inc, 4100 Ravenswood Ave, Dept AM, Chicago 13, Ill



PLASTIC VACUUM FORMING is accomplished with Model 40-A Pak-O-Vac, which is automatic in operation and has two work stations to allow loading and unloading without interrupting production. Vacuum forming, drape forming, and blister and skin packaging can all be done on the unit, which is approx 12 ft long and 3½ ft wide. Frames are adjustable from the outside for depth of draw. Vacuum and air controls permit use of wide range of thermoplastic film gages without danger of spoilage from excess heat or speed—*Product Packaging Engineering, 5747 Marilyn Ave, Culver City, Calif*

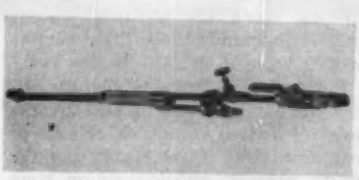
Kummer Semi-Automatic Lathe Has Dual-Head Arrangement

The Swiss-built Kummer Type MR-6020 lathe is equipped with a dual-head arrangement that permits turning of the most intricate forms and faster machining time on production runs. Operator loads work into chuck actuated by a pedal and engages the slide motion and spindle drive by depressing the starting handle.

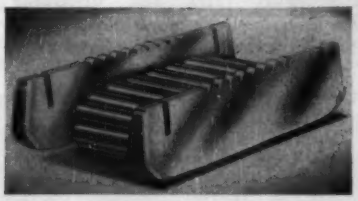
Head automatically stops at the end of each cycle. During the operation of the first head the operator changes work in the stopped second head.

Speeds to 3500 rpm are obtainable on the machine. Coordinate cam action insures precision control of cutting tool. 2½-in. capacity of chuck can be increased with special devices available. A complete line of attachments and accessories is offered.

Imported by Carl Hirschmann Co, Inc, 30 Park Ave, Manhasset, NY



HAND-CUTTING BLOWPIPE, Oxweld C-63, is reported to have the largest capacity of its kind. Ample preheat is provided for cutting thicknesses as great as 55 in. in a single pass. Separate preheat oxygen-line supply gives stable preheat flames which are unaffected by operation of the cutting oxygen valve. Cartridge mixer mixes gases uniformly. Tool is designed for use with medium-pressure acetylene—*Linde Air Products Co, 30 E 42nd St, New York 17, NY*



HEAVY-DUTY MACHINERY ROLLER called Express Roller has two main components: a series of moving rollers locked in an endless track and extending above and below a heavy steel frame; and the frame, which contains serrated edges which grip and carry work being moved. Units are offered in five ranges of sizes, from 2 to 150-ton capacity. Prices range from $25 to $175—*Industrial East Co, Express Roller Div, PO Box 561, Clifton, NJ*

Parts Are Gaged and Sorted By Precision Machine

Machine termed Precision Sorter is used in conjunction with company's Lift-O-Matic to gage or sort such items as steel balls, screws, bolts, and relay contacts. Unit will sort parts for thickness only or for head-diameter only.

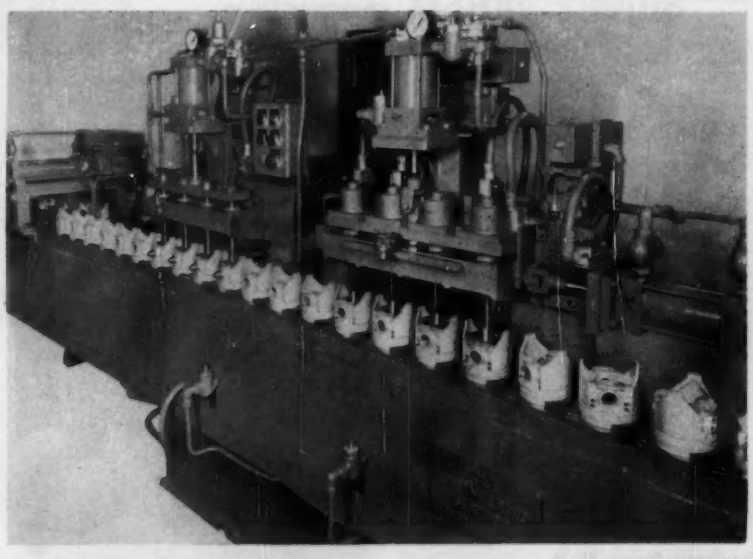
Parts are gaged at speeds up to 200,000 per hr with a maximum error or ± 0.0003 in.

Sorter consists basically of two hard-chromium plated rollers, inclined at an angle, that revolve so that their adjacent sides move upward. This action causes parts deposited between them to move along in the channel formed between the two rollers. Both ends of each roller are individually adjustable so that any opening of space between rollers is possible within range of machine. As parts move along between rollers, they fall through and into the proper receptacle when the diameter or thickness of part corresponds to the space between rollers.

U S Engineering Co, 40-24 22nd St, Long Island City, NY

Indenter mechanism of Micro-Positioner automatic indexing table (*AM*—Jun 4 '56, p183) has been improved in two ways: micro control knobs and locks allow complete adjustment of the indentation sensing and tape relocating; indenter safety switch prevents any possible indenting unless tape is installed and mechanism is in indenting position.

Micro-Positioner Corp, 716 Wilshire Blvd, Santa Monica, Calif



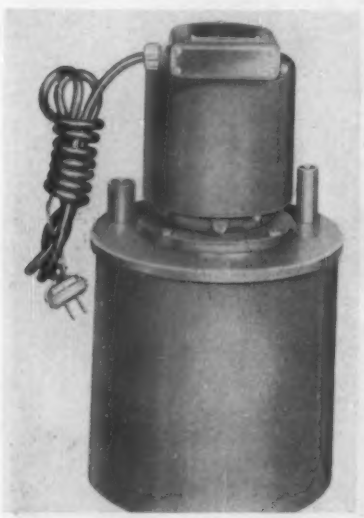
AUTOMOTIVE-PISTON PIN HOLES are sized and finished on automatic work-handling machine, which produces four parts in an 8-sec cycle. Conveyor advances four pistons at a time with a 20-in. stroke, placing them first under a locating unit which rotates them to place pin hole at right angles to conveyor. Next station inserts holder between pin-hole bosses and four "Bearingizers" are passed through pistons and withdrawn. Successive indexes bring pistons into position for unloading on belt conveyor that carries them into automatic weighing machine for sorting into 3 weight ranges—*Hole Engineering Service, PO Box 4877, Detroit 19, Mich*

New Air Hydraulic Press Saves 75% of Compressed Air

Speed Press has a dual pressure booster assembly which advances the ram to contact with the work at high speed with nominal power before full rated pressure is applied. Under actual operating conditions this has proven a minimum air savings of 75% as compared to other types of equipment of equal power and stroke. Savings is accomplished when operating press with full stroke.

Standard models are 1½, 3, 5, and 10-ton capacity, based on 80-psi air supply. Solenoid valve installation provides many combinations of automatic and semi-automatic operations.

Studebaker Hydraulic Products Co, 1733 N 33rd Ave, Melrose Park, Ill



Package Pump Unit Handles Abrasive Materials

Model 4072-T has been designed for safe handling of abrasive materials, such as silicon carbide solutions, on honing, lapping, and ultrasonic machines.

Assembly consists of a 1/10-hp Model 1P3 gusher centrifugal pump, tank with inlet and discharge pipe connections, electric cord and plug. Motor is mounted above tank lid. Even mixture of the liquid is maintained automatically at hemispherical shaped tank bottom.

Ruthman Machinery Co, Cincinnati 2, Ohio

Pneumatic-Tired Gas Truck Has 4000-lb Capacity

Model FGF-40 gas-powered, fork lift truck has over-all length of 85¾ in., turning radius of 79 in. Power steering is standard equipment. Capacity is 4000 lb at 24-in. load center; engine has 48.2 hp; standard lift height is 130 in.

Additional features include Timken power axle, loaded travel speed of 9.5 mph, hydraulic brakes, two speeds forward and two speeds reverse.

Baker-Raulang Co, Box 5579, Cleveland 1, Ohio

Sheffield Electronic Comparator Measures and Inspects

Accutron comparator is a high-speed unit with electronic gaging circuit that is unaffected by normal line-voltage fluctuations. The remote electronic amplifier is available with standard dual amplification of 1000/2000; 2500/5000; 5000/10,000; 10,000/20,000; or 20,000/40,000 to 1. Amplifier has a 4-in. zero center equilinear scale. Amplification within each dual range can be changed from one to another by flip of switch, without adjusting the indicating-meter mechanism.

Size-sensing element is company's Electrojet pickup unit—a transducer gaging cartridge that requires no pickup calibration; the same unit can be used with all amplifications.

Accessory equipment includes pressure attachment, gage-point lifting device, and a three-wire thread-checking tip.

Sheffield Corp, Dayton 1, Ohio

Electro Magnetic Plate Clamp Is Lighter Weight Model

Portable PC-6 for positioning and holding work for welding weighs only 78 lb, stands 10 in. high; earlier models were 16 in. tall.

Performance features include direct lift of up to 6500 lb, and reverse polarity switch for quick release of magnetic pull. Users report savings up to 50% in welding set-up time with the new model.

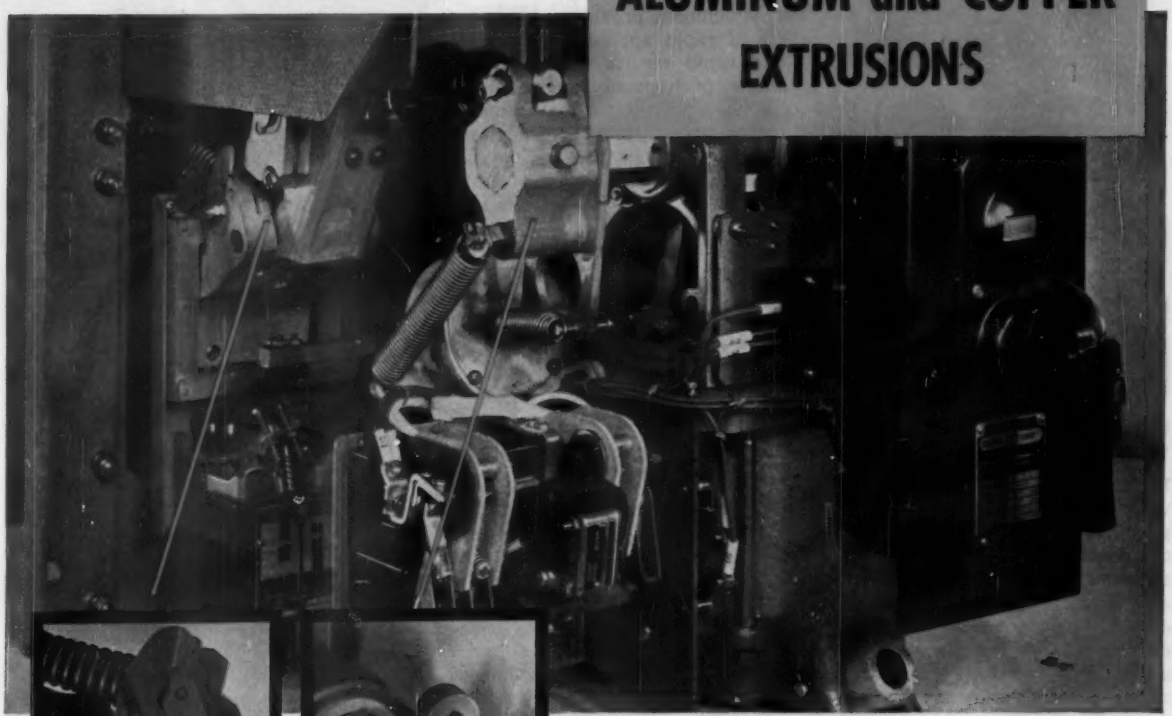
Buck Mfg Co, 100 Roberts Rd, Los Gatos, Calif

Drill and reamer blanks are available from stock in fractional sizes 1/16 in. through 1 in., wire-gage sizes No. 1 through No. 80, and letter sizes A through Z. Blanks are also offered in complete sets, packaged in metal cases.

Lavallee & Ide, Inc, Chicopee, Mass

REVERE
ALUMINUM and COPPER EXTRUSIONS

I-T-E CIRCUIT BREAKER—KD (3,000 amp. rating) showing progressive assembly with Revere Copper and Aluminum Extrusions in place. I-T-E Circuit Breaker—KE is same type with 4,000 amp. rating.



COPPER
for conductivity

ALUMINUM
for economy

—form a Money-Saving team in latest

I-T-E CIRCUIT BREAKERS

Revere T. A. Service an Important Factor in Ultimate Design of Parts

The larger of the two extruded and drawn copper shapes shown at extreme left started out on the drawing board as two pieces. It was thought that a single shape of this size could not be made satisfactorily. At this point, I-T-E Engineers got together with Revere's T. A. (Technical Advisory) Service and threshed things over. The final result is the one-piece extrusion shown and a reduction in machining time.

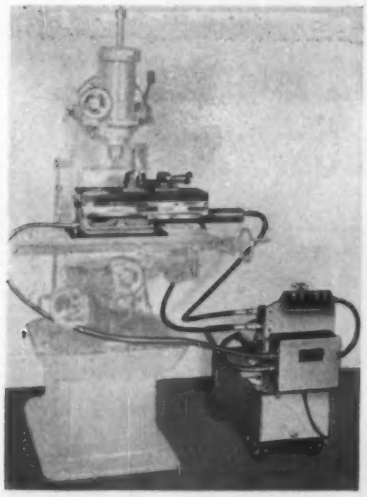
Aluminum was selected for the other extrusion shown because I-T-E found that it cost less per pound of metal and had a higher strength ratio when compared to a casting. Also, space was a factor. In all, Revere supplies 5 copper and 2 aluminum extrusions for KD and KE type I-T-E Circuit Breakers. All were designed to fit specific requirements of I-T-E Engineers. Where it could be used satisfactorily, aluminum was applied because of economy, while current carrying members called for copper.

This is still another example of Revere supplying the metal that will do the best job and with the greatest economy . . . be it aluminum, copper or any one of their alloys. So, with new things happening all the time in non-ferrous metals it can pay you to keep in close touch with Revere.

COPPER ★ BRASS ★ 18 01 ★ REVERE ★ ALUMINUM

REVERE COPPER AND BRASS INCORPORATED
Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N. Y.

Mills: Baltimore, Md.; Brooklyn, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Newport, Ark.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.



Gilman Attachment Converts Mill To Semi-Automatic Production

Hydraulic-operated slide assembly, used with a self-contained power pack, can be adapted as a stock component for special machine construction or as a mass-production attachment for toolroom milling machines. Any standard toolroom miller can be converted into a semi-automatic production machine in about 5 min by mounting attachment on machine table, attaching hydraulic hose lines and the limit-switch electric cable to the power pack, and plugging the power pack into a 110-v ac outlet.

Attachment provides complete cycle of rapid approach, feed, dwell, and rapid return, controlled by a single pushbutton. Over-all stroke length is 8 in. Rapid traverse movements in either direction may be regulated for any desired speed up to a maximum of 160 ipm. Infinite control of feed rate permits any cutting speed from 0 up to the rapid-traverse rate.

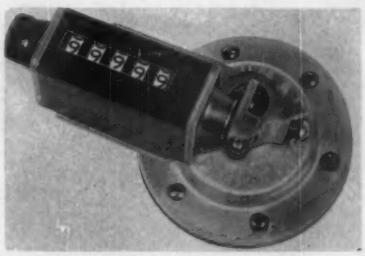
Russell T Gilman, Inc, 623 Beech St, Grafton, Wis

New Holders for Chamfering Added to Multicut Line

Two new styles designed for 30° and 45° chamfering operations have been added to Wesson's line of standard Multicut holders for throw-away carbide inserts. They are applicable also to straight turning, plunge feed turning and facing operations.

The 30° lead angle style, designated TDRC-TDLC is also suitable for 90° shoulder turning by angling the holder in the toolblock. The 45° style is designated SERC-SELC. Both incorporate standard replaceable parts including one-piece insert seat and locator, adjustable carbide-faced chip breaker-clamp, and locking screw.

Wesson Co, 1220 Woodward Heights Blvd, Ferndale 20, Mich

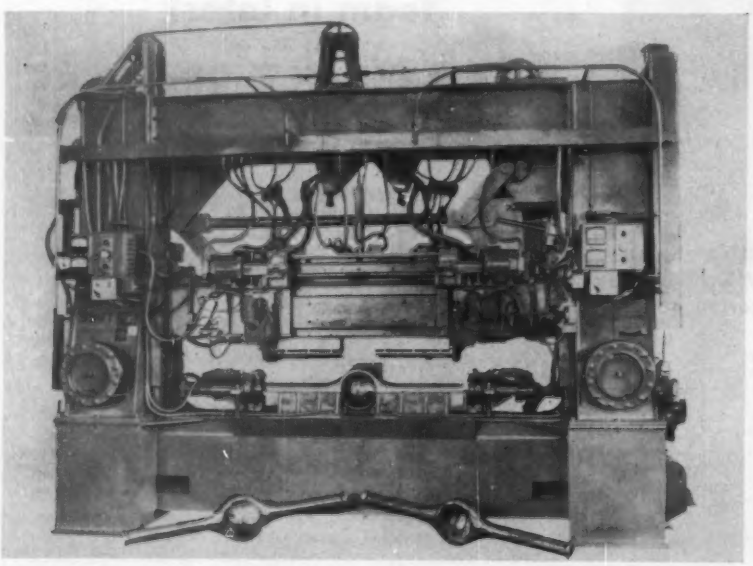


Automatic Counting Device

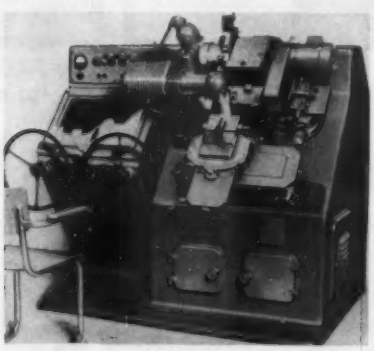
Counter screws into the line controlling any air or hydraulic cylinder and can be installed in five minutes. There is no linkage to assemble or get out of adjustment, no solenoid; reportedly eliminates possibility of half or miscounts.

Models are available for from 1 to 5000 psi, and up to 300 counts per minute; available with five or six digits, and knob or key reset.

Pneumaticount, 3400 NE 54th Ave, Portland, Ore



AUTOMOTIVE REAR-AXLE HOUSINGS are welded on automatic submerged-arc welder, which features simultaneous welding with 4 platen-mounted heads. Unit is designed to weld transverse seams in the housings, but tooling is adaptable to a variety of submerged-arc applications. In use, two stampings are clamped in the machine. An upper platen, suspended from the crown by toggle linkage, clamps the housing halves during the welding operation—*Swift-Ohio Corp, 8095 Livernois, Detroit, Mich*



PETEWE OPTICAL PROFILE GRINDER (West Germany) is available in two sizes: PFS 3D with magnification of 20 and 50x, max workpiece thickness, 2 in.; PFS 4U, with 10, 20, 50, 100x; max thickness, 3.15 in.—*Distributed by Carl Hirschmann Co, Manhasset, NY*

the fastest piloted airplane in the world . . . flying at more than 1650 miles per hour, or more than two and one-half times the speed of sound

BELL AIRCRAFT CORP.
BUFFALO, NEW YORK

SIDNEY *Heavy-Duty* LATHES

the fastest precision lathes . . . often saving more than two and one-half times on costs

photographed in the plant of BELL AIRCRAFT CORPORATION BUFFALO, NEW YORK

DON'T LET OBSOLETE LATHES PUT YOU OUT OF THE RUNNING

LET **SIDNEY LATHES** REDUCE PRODUCTION COSTS

ACCURACY

amazing accuracy assured. The Sidney Fluid Tracer Lathe on diameters and shoulder work repeats to extremely close tolerances as many times as desired.

PRODUCTIVITY

work formerly requiring long, tedious hours is now done in minutes.

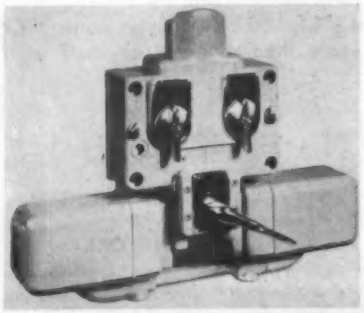
SIMPLICITY

within 2 or 3 seconds Sidney Fluid Tracer Lathes can be converted to standard lathe operation and vice versa.

Write for bulletins

THE SIDNEY MACHINE TOOL CO. • SIDNEY, OHIO

Builders of Precision Machinery since 1904



Vickers Traverse and Feed Panels Provide Automatic Machine Control

Three new series of sub-plate-mounted traverse and feed panels for control of industrial oil-hydraulic systems are available for such applications as control of drilling, boring, milling, and grinding machinery. Units feature improved valve sections for direction and feed control. Each is available in a broad selection of models. Series are designed for use with ¾-in. nominal pipe size, have a maximum recommended operating pressure of 1000 psi.

Series CPP panel consists of flow-control valve section, solenoid-controlled directional valve, and manual operating lever.

Series CPD panel (illustrated) consists of flow-control valve section combined with solenoids. Main valve spool is directly operated by energizing the solenoids. Manual operating lever is included for set-up and emergency use.

Series CPN panels consist of the flow-control valve section with a manual operating lever, and are designed for use with an external solenoid to actuate motion reversal.

Vickers, Inc, Box 302, Detroit 32, Mich

Lightweight Orbital Sander Operates at 40-psi Air Pressure

Model 800 weighs 3 lb, fits into palm of the hand. Unit operates on 6000 cycles for fast material removal. Air pressure is only 5 to 7 cfm.

Unit, designed for rough sanding and preliminary operations, can be used for wet sanding if separate supply of water is provided. Model takes a 3 x 8-in. sheet of sandpaper.

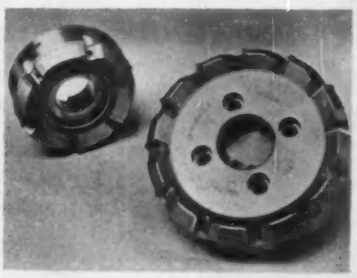
Sundstrand Machine Tool Co, Pneumatic Div, Rockford, Ill

New Armorbelt Conveyor Is Made of Aluminum Alloy

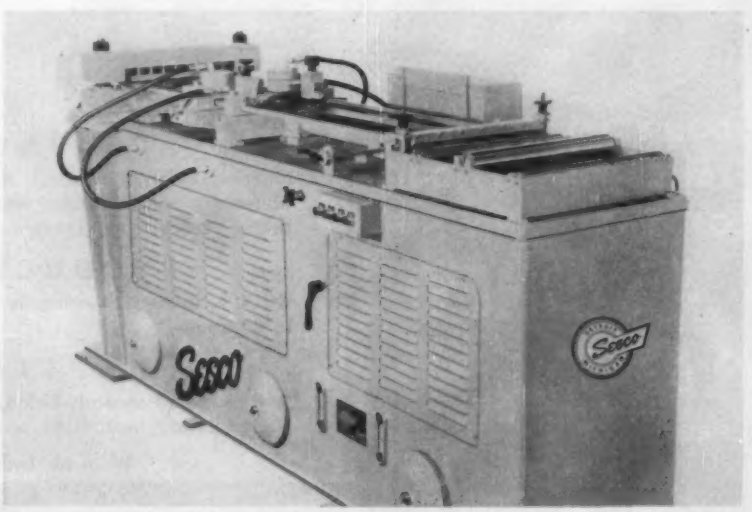
Aluminum Armorbelt is manufactured in 12, 18, 24, 30, 36, 42, 48, 54, and 60-in. widths and in lengths up to 200 ft. All fixed and variable speeds are available up to 60 fpm.

Strength, light weight, and smooth surface are made possible by use of spotwelded aircraft-type construction. Frame is enameled steel; for further weight reduction, aluminum alloy frames can be furnished.

M-H Standard Corp, 513-521 Communipaw Ave, Jersey City 4, NJ



MILLING CUTTERS designed for use with indexable throwaway carbide inserts feature single locking mechanism with only two parts—a wedge and a screw. Projections, including screw heads, that could interfere with chip flow are eliminated. Design of cutter body and wedge provides a large amount of blade support. Blades can be indexed to 8 positions before being discarded—*Wesson Co, 1220 Woodward Heights Blvd, Ferndale, Mich*



PRESS FEED for handling highly polished stock is called Sesco-Matic and consists of 3 sections: 1st section is a stock lubricator which submerges stock, lubricates it completely; in second section, hydraulic double-gripper feed is incorporated; a precision cut-off comprises section 3, where cut-off is sequenced with feed cycle and is actuated at completion of forward stroke or during return stroke of the feed grippers. Self-contained unit can be moved readily—*Sesco, Inc, 8881 Central Ave, Detroit 4, Mich*

Presenting the new

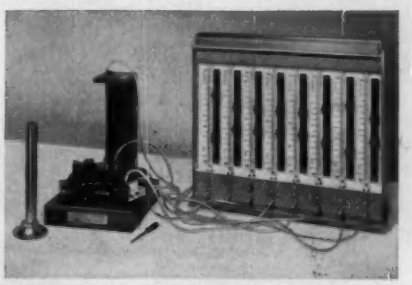
DEARBORNAIRE

COLUMN-TYPE AIR GAGING INSTRUMENT

Never before has there been an air gage instrument quite like the new Dearbornaire! For it incorporates a host of advanced design features that give you greater versatility and ease of operation with finer accuracy, minimum maintenance and lower gaging costs.

The characterized internal taper of its exclusive new glass tube assures positive linear accuracy over the full extent of the calibrated scales. Its zero-centered scales permit faster and easier reading . . . whether used for normal parts inspection, for statistical quality control, or as a tool setting gage. Interchangeability of its basic component parts simplifies conversion from one amplification to another . . . saves time, cuts costs. What's more, Dearbornaire's new higher rated pressure system and built-in circuit restrictions make it virtually self-cleaning . . . eliminate nuisance interruptions for service, reduce down-time to a minimum.

Single and multiple column instruments available now in standard amplifications of 1250-1, 2500-1 and 5000-1. Free demonstration arranged upon request. Write for complete information today!



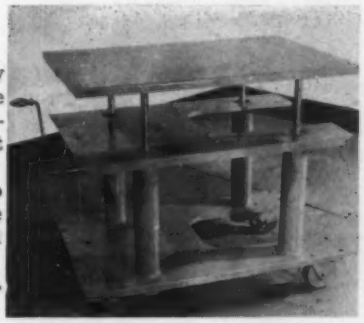
Multiple column Dearbornaire instrument and a special fixture equipped with Dearborn contact cartridges to check eight close tolerance dimensions at one time.

AIR GAGE DIVISION

DEARBORN GAGE COMPANY

22038 BEECH STREET DEARBORN, MICHIGAN

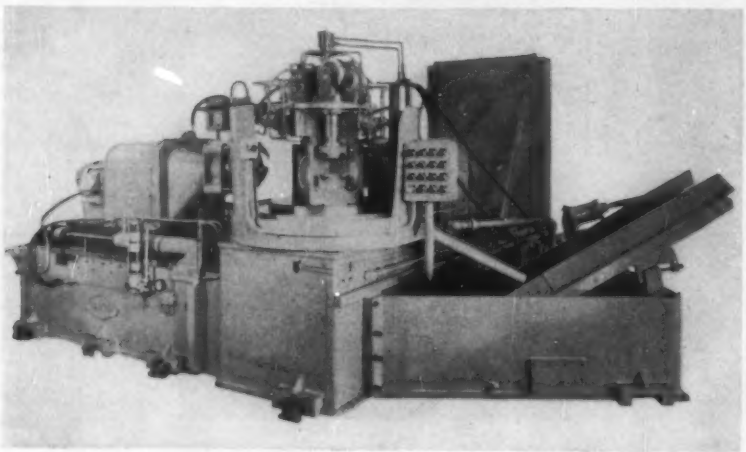
Elevating Shop Truck Handles Heavy Loads



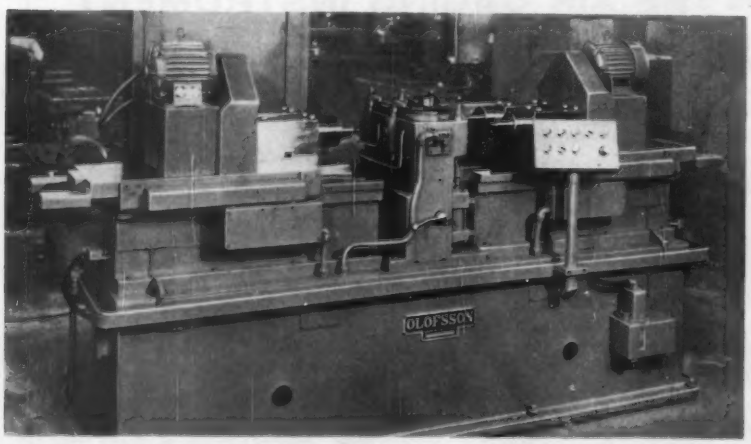
Improved line of extra heavy-duty units has all weldment steel frame construction, 2-speed elevating mechanism compensating for both light and heavy load lifting.

Steel wheels are rubber-tired, top deck is standard size. Truck can be used for tool and die handling as well as for press feed work.

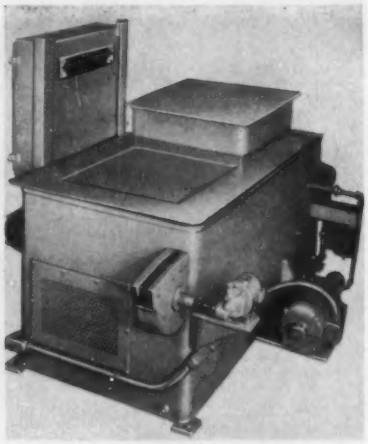
Dayton Rogers Manufacturing Co, 2824-13th Ave S, Minneapolis 7, Minn.



STEEL ELBOWS are faced and chamfered on both ends simultaneously in horizontal 2-way index machine, which produces 146 per hr on 1-in. elbows and 27 per hr on 4-in. size. Electric-powered index table has two positions. Single-point carbide tools are mounted on sliding catheads which pilot from the ID of the elbow. Operation is automatic, with operator loading and unloading. Machine is composed of standard components that can be adapted to other uses—*Baker Bros, Inc, Toledo 10, Ohio*



AUTOMOTIVE DIFFERENTIAL CASES are machined on two-station, double-end precision boring machine arranged with way units. Unit finish-bores two holes in line simultaneously in the cast-iron cases at a rate of 250 per hr. Holes are bored straight and round within 0.0005 in. Machine is designed for manual loading and unloading; an elevator device assists operator. Entire operating cycle is pushbutton controlled—*Olofsson Corp, 2728 Lyons Ave, Lansing, Mich*



Gear Washer Handles 1000 Parts Per Hour

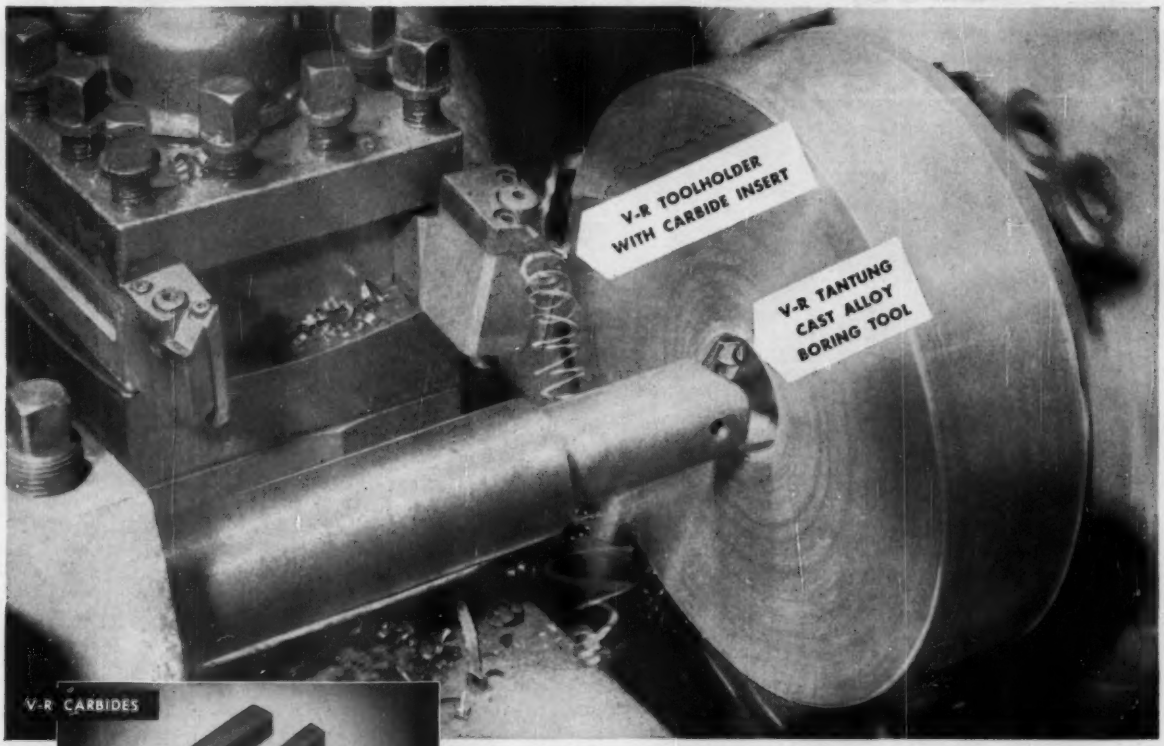
Compact gear washer can handle up to 1000 parts per hr, with the parts being spray washed and blown dry as they travel 4 ft through the unit. Washer, which operates at room temperatures, is not limited to handling gears, but can be used for any production-line cleaning operation on relatively small parts. Size requirement of parts, which may be received by gravity or from a collecting floor conveyor, is 3-in. maximum in any dimension.

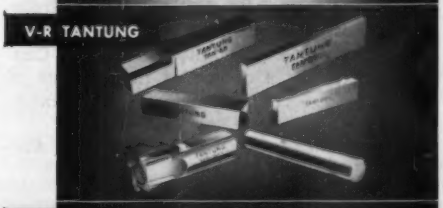
Pump is used to spray washing solution on the moving part, and an oversize scavenger pump pulls the solution out of the bottom sump and into the top tank. A 1-hp blower dries work. Floor space for washer is 3 x 5 ft.

Gear-O-Mation Div, Michigan Tool Co, 17140 E 10 Mile Rd, E Detroit, Mich

END-MILL ADAPTERS are designed to accommodate a recently announced series of 1½-in. shank-diameter end mills for aluminum and its alloys. Adapters are standard for No. 50 NS drive machines. Two setscrews firmly hold the straight-shank end mills—*Goddard & Goddard Co, Detroit 23, Mich*

How Multiple Tooling with Carbides and Tantung Cast Alloy Can Reduce Machining Costs





Surface Speed Dictates Choice of Tool

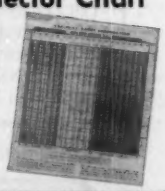
The boring and turning operations on normalized oil hardening tool steel pictured above illustrate the economies possible by correct use of both carbide and cast alloy cutting tools. The 8″ O.D. is being turned at 450 surface feet per minute (215 RPM) with a V-R toolholder and throwaway carbide insert. The boring speed is 112.6 SFPM on the 2″ I.D. At this lower speed carbide tool life is drastically reduced by build-up, while H.S. steel tools fail prematurely because of excessive heat.

The answer is to use V-R Tantung cast alloy for the boring operation. At 112.6 SFPM Tantung tool life is markedly superior to carbide or high speed steel. The reduction in regrinds and downtime results in higher production and major cost reduction.

Vascoloy-Ramet manufactures a complete line of both carbide and Tantung cutting tools to provide maximum machining economy on any job. For complete details and CATALOGS, call your V-R Representative or Distributor or write to V-R today.

FREE Surface Speed Table and Tool Selector Chart

This handy chart shows the general cutting speed range for HSS, TANTUNG and CARBIDES . . . shows RPM for various diameters to deliver surface speed desired. Ask for your copy—no obligation.



MANUFACTURERS OF:
CEMENTED CARBIDES, TOOLHOLDERS and TANTUNG® CAST ALLOY CUTTING TOOLS

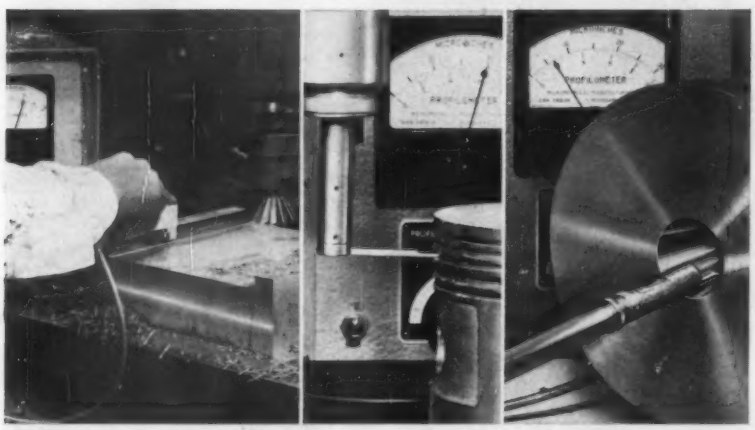
Vascoloy-Ramet Corporation

SUBSIDIARY OF TANTALUM METALLURGICAL CORPORATION

808 Market Street • Waukegan, Illinois

CT-607

How to be SURE about Surface Roughness



NO NEED TO GUESS or wonder about the roughness of parts that you make or buy. With the PROFILOMETER® at hand, you KNOW the roughness, because —

1 The Profilometer *measures* surface roughness in definite *microinch units* (arithmetical or r.m.s. average height). It eliminates the errors and uncertainties of inspection by touch or sight.

2 It is *accurate* and *dependable*—even below 3 microinches. Cannot be set to give wrong readings.

3 It's a sturdy, portable SHOP TOOL — as easy to use as a dial gage.

4 It is *versatile.* Measures almost *any* surface, internal or external, over any desired length. Measures plastics, glass, etc. as readily as metal.

5 It's been *thoroughly proven* in thousands of production and inspection departments — *since 1936.*

FREE ILLUSTRATED BULLETIN gives details; describes cost-saving applications. *Write for it!*

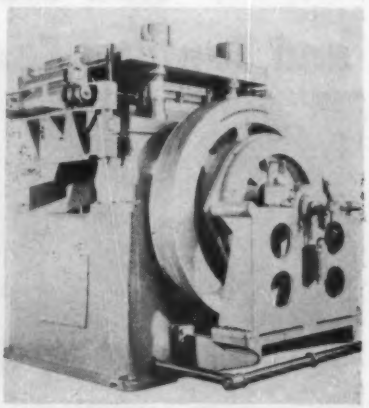
OTHER MICROMETRICAL PRODUCTS include the PROFICORDER® (for obtaining magnified surface profile records); WAVOMETER® (for measuring waviness around surfaces of rotation); ANDEROMETER® (for measuring the over-all quality of assembled ball bearings). Illustrated bulletins on request.

Representatives in principal industrial centers throughout the Free World

Names of above products are registered trade-marks.

MMC MICROMETRICAL MANUFACTURING COMPANY

351 S. MAIN ST. ANN ARBOR, MICHIGAN



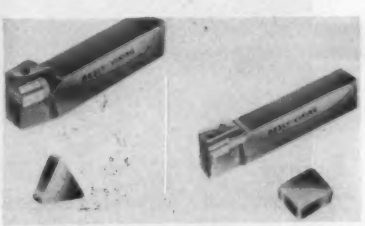
Large-Flywheel Presses Added to Brandes Line

Incorporating all features of Brandes line of presses, large-flywheel press of 350-ton size is capable of operatiing at speeds of 150 spm. Total weight of unit is 102,000 lb; clutch assembly weighs 16,000 lb and the 7-ft flywheel weighs 8000 lb.

Press has company's "V" ways, which are especially adapted to high-speed stamping operations. Eight exceptionally long guiding surfaces assure accurate alignment of the top platen, so that any cocking due to off-center loads is held to a minimum.

Press is equipped with an air-operated dry-disk friction clutch and brake mounted on the crankshaft; it is capable of stopping the press at any point in the stroke within its speed range. Press is also equipped wih double-roll feed. Customer has choice of three types of feed eccentrics: quick feed, standard 180° feed, or long feed.

Brandes Press Co, 6408 Euclid Ave, Cleveland 3, Ohio



New Toolholders Designed For Throwaway Carbide Inserts

Features of holders include positive insert location, inexpensive interchangeable parts, wide selection of negative and positive rake holder styles, sizes and shanks.

Triangular and square carbide throwaway inserts in a variety of

Tool Steel Topics

BETHLEHEM STEEL

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

Maker of Parts for TV Sets Gets Good Results with BTR

Here's a job where BTR (Bethlehem Tool Room) tool steel gets a good chance to show what it can do. The multiple-purpose die is used by Suckle Electronics Company, Camden, N. J., to pierce, notch, louver and form high-voltage shields for TV sets. The shields are made of 16-gage steel, and are turned out in a 95-ton press at the rate of more than 400 pieces per hour.

Engineers at Suckle Electronics report that they are well satisfied with BTR. They particularly like its safe-hardening property, toughness, and ability to wear and wear.

BTR is our general-purpose, manganese-chromium-tungsten grade of oil-hardening tool steel. It's a grade that is consistently racking up substantial shop savings for manufacturers in a wide range of applications. Your Bethlehem tool-steel distributor will be more than pleased to furnish complete information about BTR. Why not give him a phone call right now, while you have it in mind!

CR-MO-W Gets the Okay

After being machined by the end mill, this hot-piercing punch, made of Bethlehem Cr-Mo-W (chrome-moly-tungsten) tool steel, gets final size check by micrometer. Cr-Mo-W, an excellent hot-work steel, contains 5 pct chromium. Because of its characteristics, it is perfectly at home on jobs that involve shock, drastic changes of temperature, and heat-checking.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Don't Double Everything!

Attempting to double everything may be a wise policy in the investment field. But it can cause trouble when applied to the selection of tool steels. For example, when a successful production line is to be duplicated in larger size, the same grade of steel should not be used for each part without further consideration.

The main difficulty which arises is that the steel for a given part may not have sufficient hardenability when the part is to be made in a larger size. The reason is that tools which have been only partially hardened through will not be as strong as the deeper hardened or through-hardened tools of the original model. Secondly, the use of low-hardenability steels may be troublesome because the larger tools may be under-tempered in attempting to develop the desired degree of surface hardness. You may find that tools which are improperly tempered sometimes crack in treatment, grinding, or in service. Steel for each tool must therefore be selected with reference to the size in which the tool is to be produced.

COMMON SENSE says it's better...

Twin Screw Knee Support

Available under Tool-Lease program

Think it over... twin screw knee support is the one really new basic advancement in knee type milling machine design in years. And only Kearney & Trecker new TF Series machines have it!

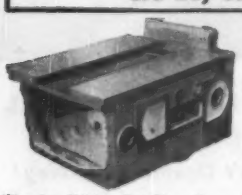
Here's why it makes sense.

Because the *twin screw* design distributes most effectively the weight of much larger, heavier knees, saddles and tables, it fulfills today's requirements for higher speeds, feeds and power — greater machine capacity. What's more, this *balanced design* substantially increases stability under heaviest loads... offers greater resistance to torsional thrust under all cuts... divides the wear factor in half, thus assuring greater, longer-lasting accuracy.

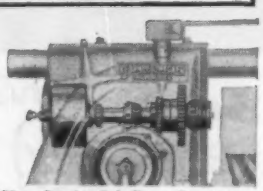
Kearney & Trecker's feature-packed TF Series line of general production machines is available in five sizes — No. 2 to No. 6, from 10hp to 50hp in Plain, Universal and Vertical styles.

Why take less than the latest when you want new milling machines? You can get all the facts on the new TF's from your Kearney & Trecker representative, or write direct to Kearney & Trecker Corp. Mail coupon for new catalog with details on TF Series machines.

5 more reasons why TF Series milling machines are way out front in rigidity

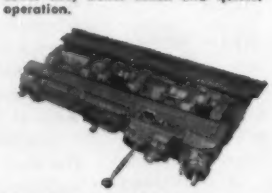


Heavier, Wider, One-Piece Knee — The TWIN SCREW arrangement supports the heavier, larger knee. Span and length of ways is increased considerably, providing fuller saddle support . . . lasting accuracy . . . substantial reduction of way and gib wear.



Three-Bearing Spindle — Complete assembly consists of three heavy-duty bearings, flywheel, a train of wide-faced forged steel gears. Rigidity of spindle unit contributes to increased cutter life, better finish and quieter operation.

Double "Vibra-Void" Overarms — Two solid steel bars, mounted completely through column, void vibration at source, afford more rigidity and resistance to deflection than any other type support. Design also greatly simplifies changing of arbors and cutters.



"Fron-Trol" Operating Convenience — Front-mounted controls include feed selection, Mono-Lever table feed and rapid traverse, automatic cycle table feed and rapid traverse controls, table handwheel, saddle clamping gib and backlash eliminator. Machines have 2" dia. table feed screw.

Massive Column — Solid back, double-box section column is scientifically ribbed throughout to rigidly withstand heaviest cutting forces. Full bearing column face affords maximum support for the knee. Cross-mounted motor assures maximum ventilation, easy access for routine maintenance.

KEARNEY & TRECKER MILWAUKEE ®

BUILDERS OF PRECISION AND PRODUCTION MACHINE TOOLS SINCE 1898

KEARNEY & TRECKER CORP.
6780 W. National Ave., Milwaukee 14, Wisconsin

Please send me Catalog No. TF-50 with details on new line of TF Series Plain, Universal and Vertical milling machines.

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CANADA
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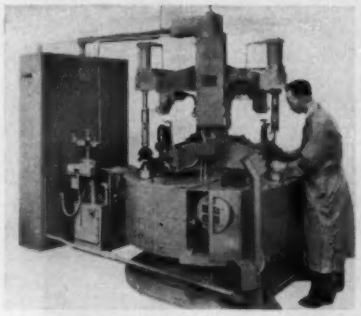
NEW SHOP EQUIPMENT

negative and positive rake dimensions are also available for use with the holders.

Besly-Welles Corp, South Beloit, Ill



BEARING LOCKNUTS of the pinion shaft in an automobile rear end assembly are automatically pre-loaded and torque tested on this unit which has torque limits of 18 to 24 in.-lb. Machine tightens locknut, checks pre-load torque on tapered roller bearings during a 5-sec run-in period. Three stations turn out 240 completed assemblies per hr—*Standard-Modern Tool Co Ltd, 373 Front St East, Toronto, Canada*

Hydraulic Skid Lift Truck Incorporates Pushbutton Controls

Self-propelled unit can hold a full load at any height with its motor off. Pushbutton control attached to a retractable reel permits operator to raise or lower load from any selected position. Control located in steering handle actuates the forward and reverse movement. Motor is used only when load is transported or raised.

Three models are available with capacities of 2000, 3000, and 4000 lb. Raised heights for the three are 36, 52, and 68 in. with lowered height of 6½ in.

General Sales & Engineering Co, 4525 N Clark St, Chicago 40, Ill

It's Not The TOOT That Runs The Train

Frank Sorensen, Jr.

TREASURER, THE CINCINNATI GEAR CO.

Did you ever get a tune lodged in the back of your head, and not be able to get it out? I happened to hear a catchy children's record awhile ago that keeps popping up in my mind; I'm a little fuzzy on the exact details but the gist of the lyrics is that "it's not the toot that runs the train, but the chug chug chug." Even though the song was obviously written to appeal to young children, the simple logic of its message is just as important to us grown-ups. Because it is all too easy to lose track of basic objectives in the normal rush of competitive business and the manufacture of a competitive product. To cut a nickel here or there off the "toot" to meet competition is one thing; but if a dime or two also gets cut off the "chug chug chug" for the same reason, it may *show up* for the first time when the product is in the consumer's hands — with lasting adverse effects. Any such quality lapse in the important O.E. products into which many of our custom gears go would be a serious matter for the manufacturer. Our clients know this, and they know that a gear can be a crucial part in their product — and that's why they come to us. They have found from experience that we make their custom gear costs *inexpensive* by giving them the *quality* and *service* they require. We'll do the same for your firm, if given the opportunity.

THE CINCINNATI GEAR CO.
CINCINNATI 27, OHIO
Fifty Years of "Gears—Good Gears Only"

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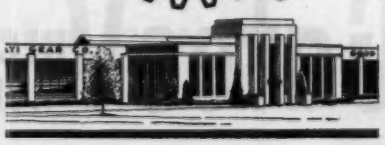
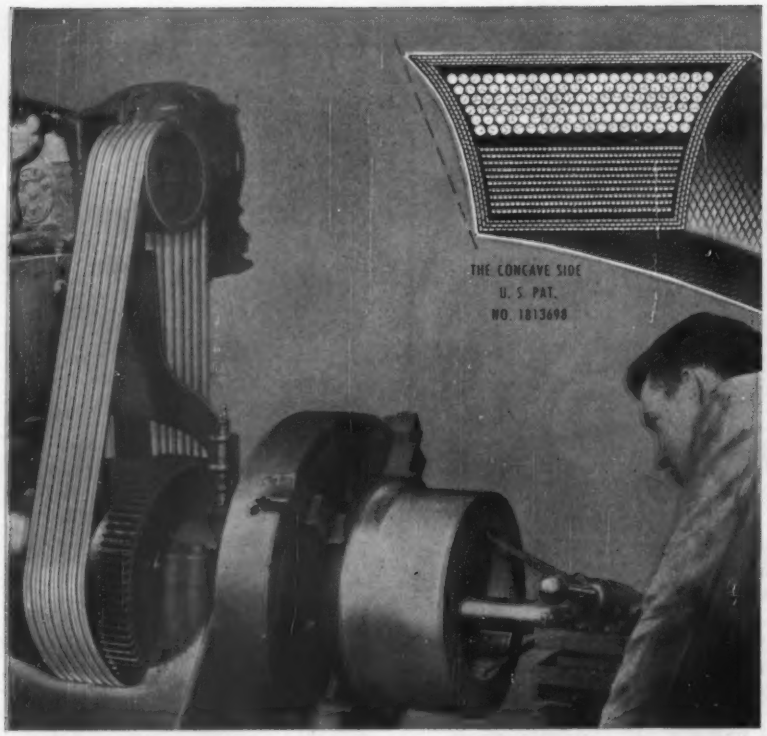




WHY you get more service from V-Belts with concave sides

Each sidewall of a Gates V-belt is concave (Fig. 1) — a precisely engineered curve that makes V-belts last far longer.

HERE'S WHY: on the bend around the sheave, the concave sides of a Gates V-belt fill out and become straight (Fig. 1-A). Thus the belt makes full contact with the sides of the sheave, grips the sheave *evenly*.

This even contact distributes wear uniformly across the sides of the belt. Uniform wear lengthens belt life; keeps costs down.

MAKE THIS SIMPLE TEST

Bend a straight-sided belt (Fig. 2). The sides bulge at the bend causing uneven contact in the sheave groove (Fig. 2-A). Naturally, wear is greater at points indicated by arrows. Result: shorter belt life, increased belt costs.

To cut down-time and V-belt replacement costs, specify belts that grip evenly and wear longer. Specify Gates Vulco Rope — the V-belt with concave sides. The Gates Rubber Co., Denver, Colorado — *World's Largest Maker of V-Belts.*

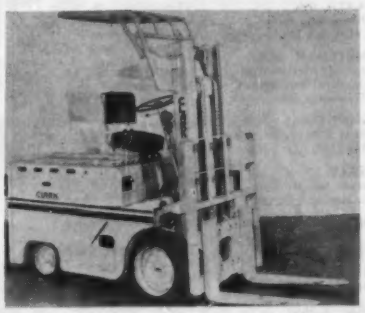
There are Gates Engineering Offices and Distributor Stocks in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

Gates

TPA 109A

Gates Vulco Rope Drives

NEW SHOP EQUIPMENT

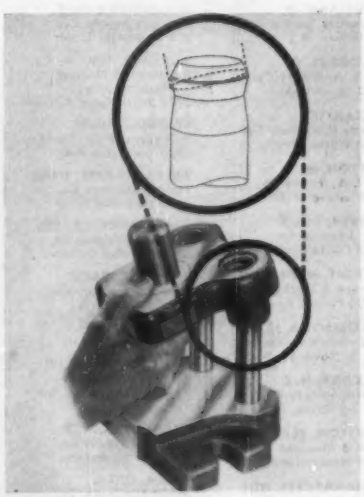


Battery-Powered Fork Truck Is 8000-lb Capacity Unit

EUT-8024 has dual drive wheels, four speeds forward and four reverse, will travel loaded at 5½ mph, and climb a 10% grade.

Dimensional features are turning radius of 85 in. aisle width for right-angle stacking (including 48-in,-long load) of 148½ in., over-all length of 133 in.

Clark Equipment Co, Industrial Truck Div, Battle Creek, Mich



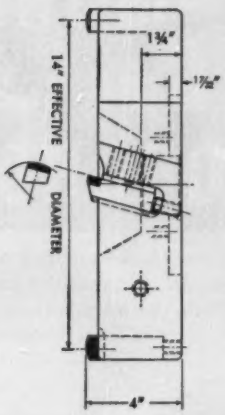
Die-Set Post Eliminates Binding, Speeds Assembly

Known as the McVey Post, precision die-set post features a ground taper lead which automatically guides the die-set punch-holder into the correct mounting position without hammering or tapping. A special land of the same diameter as the post provides a pivot plane for the punch-holder bushing, assuring quick alignment and long wear.

Post is available for both 2- and 4-post die sets; prices are reported competitive with ordinary die sets.

Standard Die Set Manufacturers, Inc, 1505 Elmwood Ave, Providence 7, RI

Ingersoll Micromill Finishing Cutter
25800MM Series...Page 28, Catalog 66



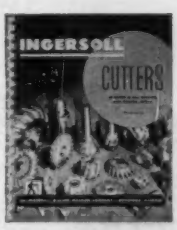
25 Micro Inch Steam-Tight Finish at Westinghouse with this INGERSOLL MILLING CUTTER

Where finish is important, look to Ingersoll for the answer. There is an Ingersoll cutter to meet virtually every finish requirement. For example, the cutter shown above is being used by Westinghouse, Steam Division, in finish milling high pressure turbine cases.

The cutters used for this work were developed by Ingersoll's research department and proved on Ingersoll's testing floor.

An Ingersoll Cutter Division representative will be glad to discuss this and other finish milling experiences with you.

Whether you are concerned with cutter costs, feed rates, longer tool life, or finish, the new Ingersoll cutter catalog will be a valuable guide. Write for your copy today, address Dept. 66K.



Use this new 82 page guide for selecting the right inserted blade milling and boring cutters for your work. Write for catalog #66, today.

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WORTHINGTON CORPORATION

CUTTER DIVISION

THE INGERSOLL MILLING MACHINE COMPANY

ROCKFORD ILLINOIS

WHY MONARCH lathe head stocks are MICROHONED

Monarch Machine Tool Company Microhones the spindle bores in its lathe head stocks because Microhoning . . . generates consistent finish, size, and alignment of bores . . . corrects out-of-roundness . . . eliminates cost of line-reaming operations . . . permits interchangeability of spindles and bearings.

And with the use of a new three-diameter Microhoning tool, honing time is reduced approximately 40% over former method which employed two double-diameter tools. One set-up now replaces multiple set-ups previously required.

APPLICATION DATA:

STOCK REMOVAL
.003″ to .004″

TOLERANCES
diameter..... .0002″
roundness..... .0001″
taper..... .0001″

FINISH....20-25 microinches

PREVIOUS OPERATION
line boring

3 IN-LINE BORE SIZES
4.125″ dia. x 1.500″ long
5.118″ dia. x 1.250″ long
6.299″ dia. x 5.125″ long

Micromatic tooling for Microhoning applications is constantly furnishing manufacturers with cost reductions, higher production and better functional characteristics. A Micromatic Field Engineer will be glad to discuss your production problems and show you "Why" the proper Microhoning tools will help.

The principles and applications of Microhoning are explained in a 30-minute, 16 mm, sound movie, "Progress in Precision" . . . available at your request.

☐ Please send me "Progress in Precision" in time for showing on_____(date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

NAME_____
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MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

TAPER-LOCK PUSHER, called Burns Pusher, is designed so that wear on the gripping surface is compensated by the automatic adjustment of the tapered locking surface. Pusher locks in forward direction and opens freely in the opposite direction; after feeding bar into position, it locks so that bar cannot slip back into pusher or bounce back from stock drop. Taper design enables gripping surface to expand and contract within a range that fits both hot-rolled and cold-finished stock without change of pusher—*Allen Collet Mfg Co, Melvindale, Mich*

WILTOMATIC AUTOMATIC BENCH VISE opens and closes up to 2000 times per hr by foot pedal air control. Max jaw locking force ranges from 2513 to 6891 lb, depending upon size of unit; power stroke is adjustable up to ½ in.—*Wilton Tool Mfg Co, Schiller Park, Ill*

Columbium and Tantalum Metals Available in High Purity State

Columbium and tantalum oxides and metals up to 99.5% purity have been recently developed by Kennametal, and are available on a production basis.

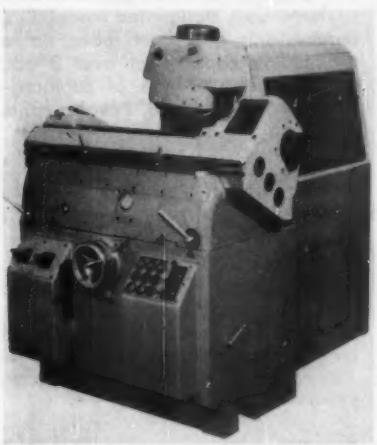
Columbium, also known as Niobium, will be made available in a technical grade, in addition to the high purity, for industrial research work as well as for commercial pur-

poses. Tantalum metal and oxide is expected to have particularly wide application in the electronic components field.

Kennametal Inc, Latrobe, Penna

Precision micro-balls for sizing and gaging are furnished in a permanent carrying case. They are tightly fitted into snap-in holes; special tool is provided to pop them out. Chrome steel balls ranging in size from 1/16 to ½ in. in dia are made to a tolerance of 0.000025 in.

F & M Sales Co, 2928 Fisk Lane, Redondo Beach, Calif



SPECIAL SPLINE-SHAFT HOBBER, Model MK-6 from Germany, also hobs spur-gear pinions. Six cutter speeds and feeds are available. Main cutter spindle runs in four bearings and is driven by two worms in constant mesh with one worm wheel. Machine is suitable for conventional as well as climb hobbing. Splines of 4 DP up to 25¼-in. length (40-in. length optional) can be hobbed from 4 teeth upwards—*Imported by Eric R Bachmann Co, Inc, 27-11 41st Ave, Long Island City 1, N Y*

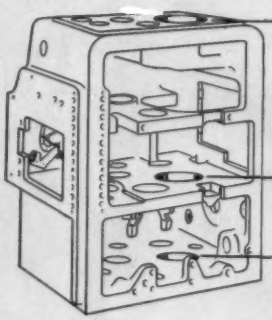
Reverse-reduction unit for 5-hp gasoline engines incorporates a 2-to-1 reduction, neutral, forward, and reverse. Unit is enclosed in oil-tight housing which is bolted to engine crankcase. Featured is a double-acting clutch with over-center shift mechanism that permits operator to shift instantly from forward to reverse or to neutral at any engine speed. Forward rotation is through duplex roller-chain drive; reverse rotation is accomplished by spur gears.

J B Foote Foundry Co, Fredericktown, Ohio

HOW with one set-up MONARCH MICROHONES three bore diameters

Using a three-diameter tool and only one set-up, Monarch Machine Tool Company Microhones three in-line bores in lathe head stocks. Bore diameters are 4.125", 5.118" and 6.299". Stroke of Microhoning tool is changed only once during the working of all three bores. Former method of honing required multiple tooling and set-up.

How Monarch Microhones:



BORE "C"
6.299" Dia. x 5.125" Long

BORE "B"
5.118" Dia. x 1.250" Long

BORE "A"
4.125" Dia. x 1.50" Long

FIRST STROKE SETTING	Bore "A" is Microhoned while guiding on Bore "B" Bore "B" is Microhoned while guiding on Bore "A"
SECOND STROKE SETTING	Bore "C" is Microhoned while guiding on Bore "B"

How This Microhone Tool Operates:

A compound cone in the tool allows any one of the three bores to be Microhoned by expanding or collapsing individual banks of stones and guides. A selector sleeve shifts the cone rod to provide positive control of abrasives and guides.

Micromatic "How" knowledge, obtained through 27 years of experience in designing, engineering and manufacturing of Microhoning equipment for all types of applications throughout the world, can solve your production honing problems.

Learn how Microhoning will give you efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

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MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

Cost Less in the Long Run . . .

. . . because PRATT & WHITNEY KELLER CUTTERS produce *more* accurately machined pieces per tool and run longer between grinds. The result is lower *tooling costs* than with other cutting tools which may cost less initially, but produce less. Correctly designed, precision manufactured from selected steels and inspected to meet rigidly high P&W standards, they are *quality* from start to finish! Now produced in both straight and taper shank types in a wide range of lengths and diameters. Available from stock at the P&W Branch Office near you.

Write now for complete information.

Pratt & Whitney Company, Inc.,
11 Charter Oak Boulevard, West Hartford, Conn.

. THREAD ROLLING DIES • DUOCONE DIES • TAPS • THREAD MILLING CUTTERS • REAMERS . . .

PRATT & WHITNEY
FIRST CHOICE FOR ACCURACY
MACHINE TOOLS • GAGES • CUTTING TOOLS

NEW SHOP EQUIPMENT

COOLANT CLARIFIER for use with grinding and honing machines uses centrifugal force to remove free abrasive grains and metal particles from coolants. Unit, designated Model 115, requires only 6 sq ft of space, has a dirt-holding capacity of over 3 gal, and handles all types of coolants—*DeLaval Separator Co, Poughkeepsie, NY*

Cutting oils in Towercut F Series have been developed for difficult broaching, gear hobbing, and tapping jobs, where problems of high pressure, heat, and friction exist. Company reports that use of oils in these applications has increased tool life greatly.

Tower Oil Co, 300 W Washington St, Chicago 6, Ill

Miniature differentials will add or subtract two rotating inputs, or angular inputs. 34 ratios from 1:1 to 27:1 are offered. Sealed construction and hardened gears assure long life. Backlash between in-line shafts is 4' or less. Units with anti-backlash feature are also available.

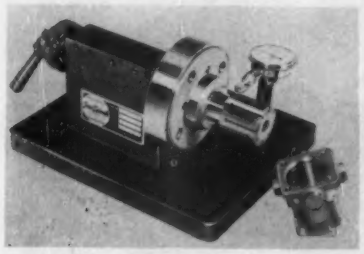
Metron Instrument Co, 432 Lincoln St, Denver 3, Colo

Plastic coolant hose can be twisted and turned into any bend and will stay set in that position. Steel-clad armor protects hose from hot, sharp chips. Hose is also impervious to acids and oils. A one-piece aerator nozzle eliminates splash and coolant throw. Hose is trademarked Kling-Flo.

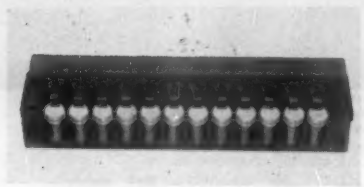
Cobon Plastics Corp, 44 Lafayette St, Newark 2, NJ

Protective coatings in Carbomastic Series are available in 5 types, with each type having a specific application. The epoxy-tar coatings have solids content ranging from 85 to 90%, and can be applied at thicknesses up to 10 mils per coat. Coat-

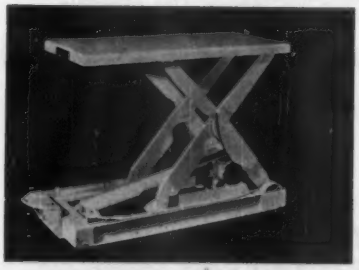
ings are said to show excellent resistance to water, high relative humidity, and to most acids, salts, and alkalies. Bulletin No. 803.
Carboline Co, 331 Thornton Ave, St Louis 19, Mo



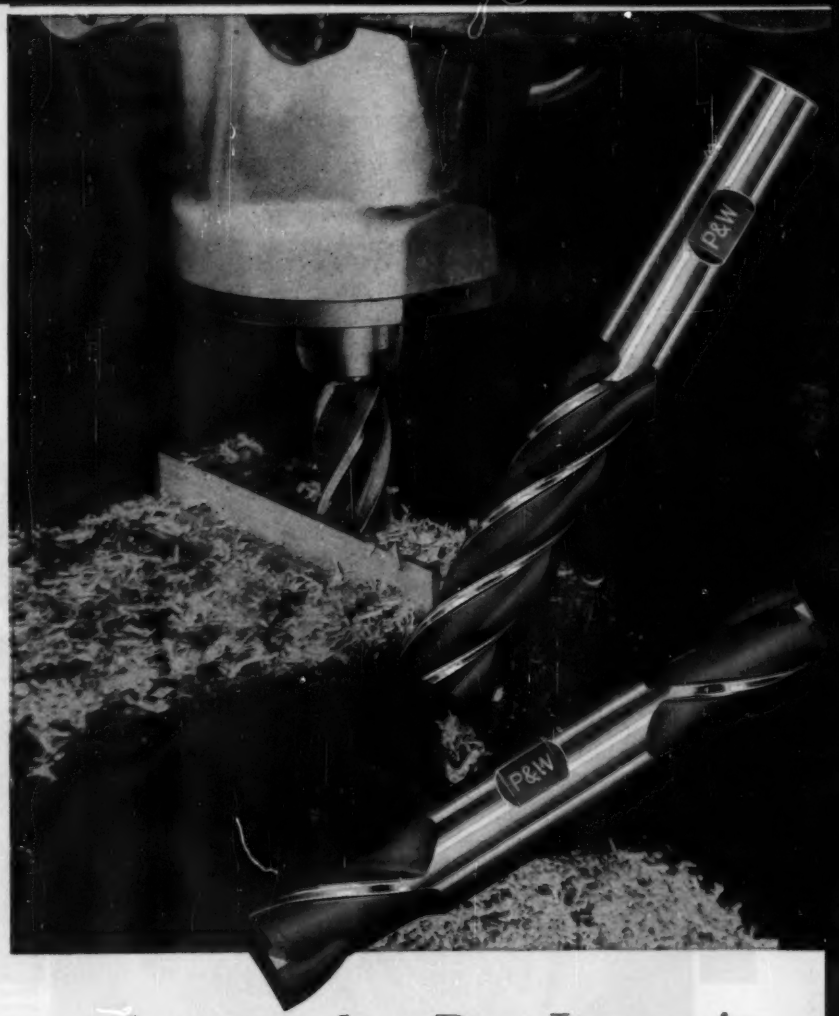
INSPECTION FIXTURE composed of stock parts can be used to check parts for concentricity and squareness. Tool is combination of company's Tork-Lok Collet Arbor and Zero Spindle inspection fixture. A number of parts can be checked on the interchangeable collet provided—*N A Woodworth Co, 1300 E Nine Mile Rd, Detroit 20, Mich*



MULTIPLE GROOVING TOOL with 12½-in.-dia button inserts was designed for a special cutting operation. The 8-in.-long steel plate that backs up inserts assures accurate groove spacing when inserts are indexed to new cutting edges. Similar tools can be fabricated to any specifications—*Kennametal, Inc, Latrobe, Penna*



LIFT TABLE called Strongback has a capacity of 4000 lb and lift of 30 in. Platform dimensions are 24 x 53 in., and collapsed height is only 7¼ in. Table is powered by a ½-hp motor;



. . . *because they Run Longer!*

. . . PRATT & WHITNEY END MILLS give you the lowest tooling cost for every finished workpiece. Correctly designed, carefully manufactured from selected steels, expertly heat treated, precision ground and rigidly inspected, Pratt & Whitney End Mills have *everything* it takes to produce finer finishes in less time and at lower costs. A complete line of types and sizes for every job requirement is available from stock at the P&W Branch Office near you.

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Pratt & Whitney Company, Inc.,
11 Charter Oak Boulevard, West Hartford, Conn.

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MACHINE TOOLS • GAGES • CUTTING TOOLS

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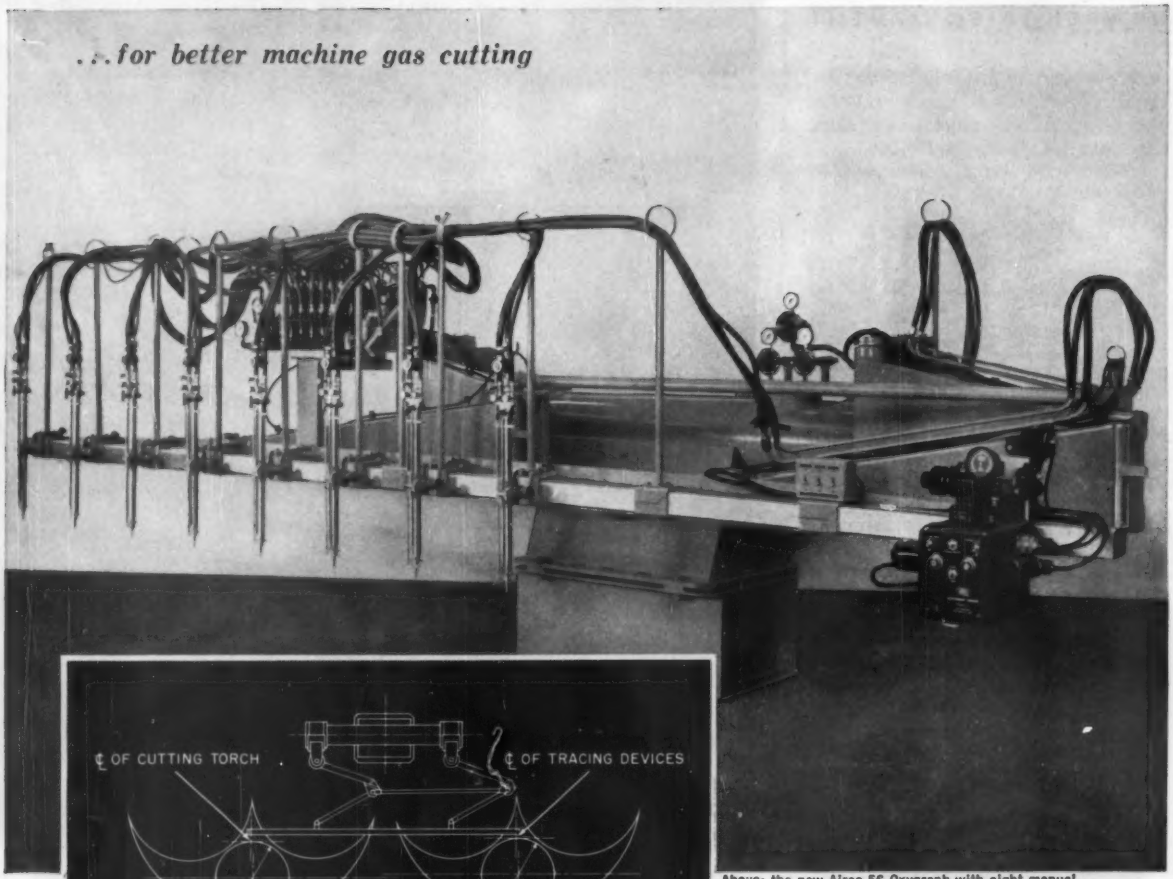

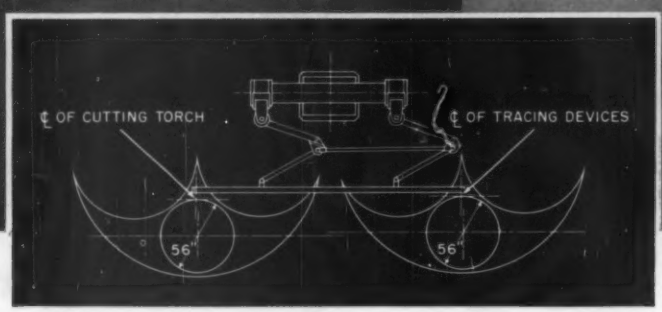

Above: the new Airco 56 Oxygraph with eight manual torches. All-welded construction provides unusual sturdiness and durability.

At left: drawing shows great versatility in patterns that can be cut with the new model 56.

NEW... Airco 56 Oxygraph

. . . for better machine gas cutting of larger work on production schedules

This newly developed Airco 56 Oxygraph meets the demand for a multi-torch oxy-acetylene shape cutting machine that will handle substantially large areas. It *cuts* a *full 56" circle*, and corresponding square and rectangular shapes. Rugged box girder design is used for the pantograph arms, holding vibration to a minimum. Tracer response is smooth and friction-free as a result of large diameter ball bearings in the pantograph hinges and operating bar assembly.

This newest of Airco Oxygraphs will cut an unlimited variety of shapes from steel plates, slabs, billets and forgings. Flexibility of design allows amplifying scope of machine to meet increased shop demands. Tracers are available in four types: electronic, manual, magnetic and spindle. This widened capacity of the new model 56 marks another step forward in welding and cutting progress. For detailed information on the New 56 Oxygraph, write direct to Airco.

welding
AT THE FRONTIERS OF PROGRESS YOU'LL FIND . . .

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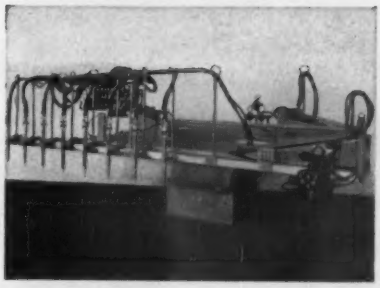
Products of the divisions of Air Reduction Company, Incorporated, include: **AIRCO** — industrial gases, welding and cutting equipment, and acetylenic chemicals • **PURECO** — carbon dioxide, liquid-solid ("DRY-ICE") • **OHIO** — medical gases and hospital equipment • **NATIONAL CARBIDE** — pipeline acetylene and calcium carbide • **COLTON** — polyvinyl acetates, alcohols, and other synthetic resins.



this brand new Model 56 OXYGRAPH

has these exceptional advantages

Cuts a full 56" circle, and corresponding square and rectangular shapes

•

All-welded steel construction for lasting durability

•

Box-girder design of pantograph arms assures efficient operation even with maximum loading of operating bar

•

Reinforced operating bar provides for mounting of torch holders, torches, tracing devices and electrical control equipment

•

Centralized gas control of torches with electrical solenoid valves allows operator to turn on, light and shut off gases without leaving tracing table

•

A maximum of 8 torches can be used, with manual or motorized torch holders

•

A cutting-oxygen ease-on valve, supplied with the machine, is invaluable in making piercing starts

You'll find the new AIRCO 56 Oxygraph a substantial production help in metal shape cutting. For complete details

write direct to

AIRCO

scissors-type lift is controlled by an electro-hydraulic pump. Model has one pair of fixed wheels, a pull plate, and a detachable dolly or skid spotter—*Southworth Machine Co, Portland, Me*

SIX-POWER MAGNIFYING GLASS called Magnaglass is mounted in a transparent housing and fitted with magnets that cling to any magnetic material. Device can be positioned at any angle on a tool, provides magnified readings of scales. Price is $2.95 —*Clarencrest Sales Co, 99 E Terrace Ave, Lakewood, NY*

Curing agent, Sonite No. 41, for epoxy potting and encapsulation of electrical components is a low viscosity liquid that mixes readily with liquid resins at room temperature, reportedly gives long pot life. Properly cured castings exhibit relatively high heat distortion temperature and toughness.

Smooth-On Manufacturing Co, 573 Communipaw Ave, Jersey City 4, NJ

RESISTANCE HEATER, Model RTR6 Regulator, is designed for multiple small-tube heating from 1½ to 2¾ in. Heating is accomplished by elements regulated from the heater. Controlling unit can be used in conjunction with a pyrometer-controlling unit to control the heating of 6 welds simultaneously—*Electric Arc, Inc, 162 Jelliff Ave, Newark, NJ*

Rosin core solder designated RTS-300 is said to have outstanding noncorrosive characteristics and minimum odor. Activating chemicals used in the solder are not toxic to the touch or to the respiratory tract. Company stocks 40/60 and 60/40 lead-tin combinations of the solder in 0.062-in.-dia wire, in 1, 5, and 20-lb spools.

Federated Metals Div, American Smelting & Refining Co, 120 Broadway, New York 5, NY

Pressure-sensitive tape designated No. 66 is transparent, uses a special polyethylene - surfaced cellulosic backing. Adhesive is a special resinous material. Tape is available in rolls ½ in. wide and about 2600 in. long. Top surface of tape is resistant to acids and alkalis and is impermeable to greases, oils, and powders.

General Tape Corp, First National Bank Bldg, St Paul 1, Minn

Hydraulic piston pump, Series PF-3006, has 3000-psi maximum intermittent pressure and rated pressure of 2000 psi. Pump is ruggedly designed for use on heavy-duty equipment. The 25-lb unit will handle 2.8 gpm at 1200 rpm and 4.15 gpm at 1800 rpm. Shaft rotation can be had in either direction, and unit can be mounted in any position.

Dynex, Inc, 1500 S Muskego Ave, Milwaukee, Wis

Measuring scale called EMscale is available in lengths up to 12 in. and is sub-divided into increments of 0.001 in. Accuracy of scale is reported within 0.0001 in. A simple microscope is used to view the scale and to make close readings possible. Scales can be made of many materials, so that for very precise work where thermal expansion must be considered, they can be furnished in the same material that is being measured.

Elliott-Myers Corp, 83 Hammond Rd, Warren, Penna

Hardened HSS drill blanks are offered in 182 standard stock sizes in

a wide range of lengths, diameters, and tolerances. Four sets are also offered. Blanks are reported suitable for use as knockout pins, punches, dowel pins, gages, and rollers for high-temperature applications.

Ace Drill Corp, Adrian, Mich

Fire-resistant hydrolube fluids, Ucon 150-CP and 275-CP, reportedly have outstanding corrosion and wear resistance. Fluids are used where petroleum oils present a fire hazard; with these water-base fluids, hazard is minimized as long as the recommended water content is maintained. Fluids are said to have no harmful effects on packings or seals, can be used with ordinary filters.

Carbide & Carbon Chemicals Co, Div of Union Carbide & Carbon Corp, 30 E 42nd St, New York 17, NY

Conversion coating for zinc-plated surfaces, Luster-On 52 powder, is of single-dip, no-leach type. Powder was developed for automatic equipment where facilities are not available for added leaching and rinsing. Powder gives a bright bluish hue, provides corrosion protection against staining, tarnishing, and white powder products.

Chemical Corp, Springfield, Mass

Thread triangles, designed for measurement of threads, are hardened, precision-ground gages in the form of two 60° triangular bars. Each set comes with chart of sizes for all standard threads. Each point in the triangle is used for measuring threads between specified pitch diameters.

Montgomery Tool Co, 7 Tichenor Lane, Newark 5, NJ

Threaded plug stock in complete line of special alloyed and processed cast-iron material is heat-treated and stress-relieved, with tensile strength of 45,000 psi. Processed from 12-in. bar and threaded for 11-in. American National Coarse thread, stock is made in 8 diameters. Special sizes and pitch diameters can be supplied in steel, non-ferrous, and stainless steel.

Claude Sintz, Inc, 1928 Stanley Ave, Detroit 8, Mich

Portable electric screwdriver trademarked Sioux is offered with positive or adjustable clutch. Positive clutch provides free spindle for engaging bit with screw; operating pressure closes clutch and continues to drive until resistance is greater than hand pressure. Adjustable clutch is used where uniform tightness is desired, no matter how much pressure the operator applies. Tool may be equipped with reversing switch, so that it will remove as well as drive screws.

Albertson & Co, Inc, Sioux City, Iowa

Corrosion-resistant greases known as Keystone 5P line provide effective protection against more than 100 corrosive agents and solvents. Line consists of 3 types covering operating temperatures from 0 to 350 F. Greases have smooth, nonfibrous body, are pale amber to light cream in color, are made in four consistencies, and have an ASTM penetration range of from 200 to 350. Greases can be used to lubricate a wide variety of machines.

Keystone Lubricating Co, 3100 N 21st St, Philadelphia 32, Penna

Plastic gasket material can be coated to flange faces and gasket surfaces to reduce vacuum-line leakage. Any slight leakage which may occur after line has been in service for some time can be corrected by the application of 1/32-in. of the material around the outside surfaces of the flange where they meet with the gasket. Material is available in two formulations, one for air, steam, water, and mild chemicals, other for gasoline, oil, and solvents.

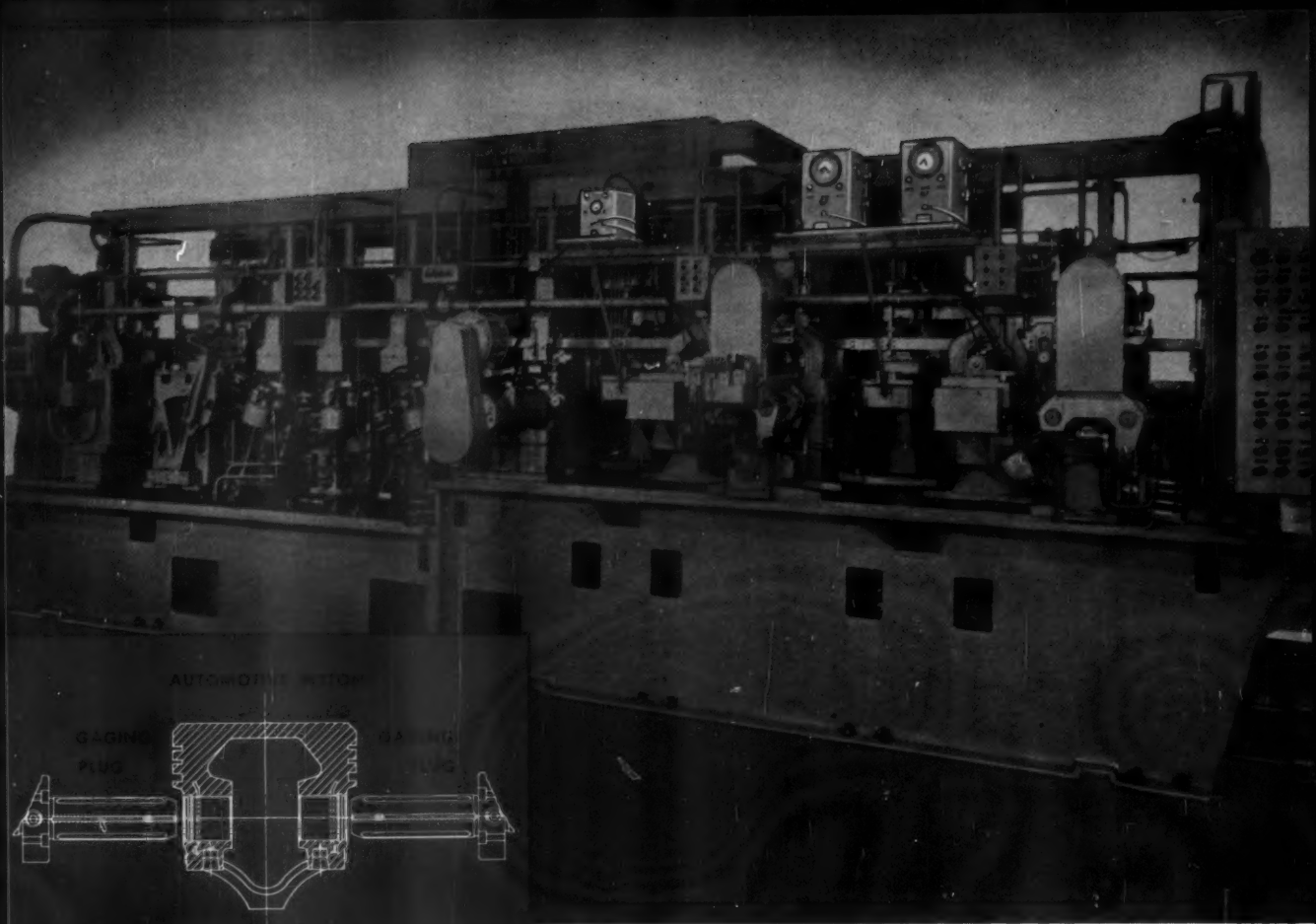
Flexrock Co, Packing Division, 3600-A Filbert St, Philadelphia 1, Penna

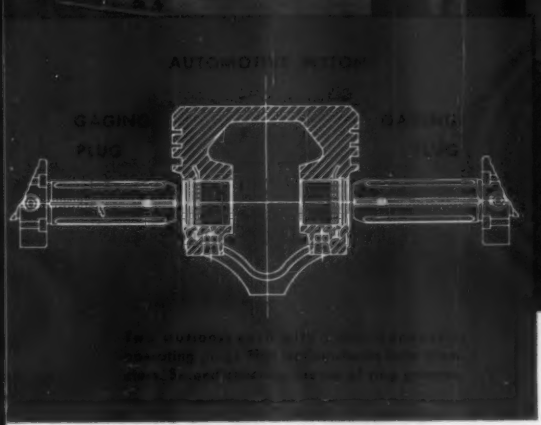
Compound for lacquer spray booths is designed to condition the water, protect the equipment, and reclaim paint in all water-type spray booths. Designated No. 1160, compound is non-caustic, non-oily, and non-foaming. It forms a protective film around paint molecules and causes them to float rather than sink. The "captured" paint can be skimmed off and reclaimed.

Klem Chemicals, Inc, 14401 Lanson Ave, Dearborn, Mich

Vitrified grinding wheels, designated 20 Structure, are designed with grit spacing for improved chip clearance; pore volume and shape provide a wheel said to resist loading, take heavier bites, and eliminate burning and distortion. Wheels, available in aluminum oxide or silicon carbide,

BUILD A GAGE INSTALLATION TO SUIT YOUR NEEDS . . .
with these packaged, on-the-shelf P&W Air-O-Limit Light Signal Units. Can be used to signal operator or to provide feed-back impulse for fully automatic process control.
BASIC 2-LIMIT UNIT . . . indicates high and low tolerances. Suitable for sorting and other "yes-or-no" control applications.
3-LIMIT UNIT . . . especially suited for grinding and similar operations. Indicates or automatically controls such conditions as: "Fast Feed," "Slow Feed," and "Spark-Out."
4-LIMIT UNIT . . . similar to 3-Limit Unit, but provides greater control scope. Indicates or controls such conditions as: "Approach High Limit," "High Limit," "Approach Low Limit" and "Low Limit."





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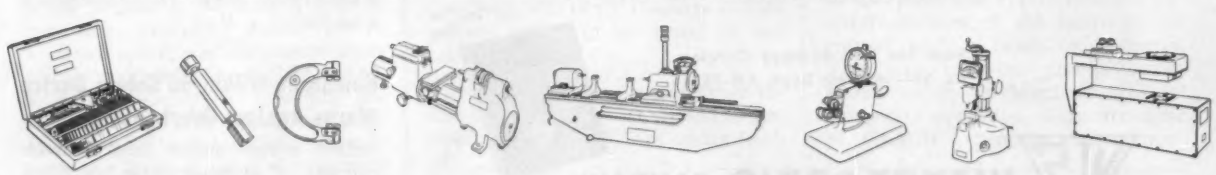
Help Yourself to Increased Output

WITH PRATT & WHITNEY STANDARD, ON-THE-SHELF GAGE CONTROL UNITS

INCREASED OUTPUT RATES, INSURED ACCURACY, REDUCED REJECT LOSSES . . . are the benefits you get with On-Machine Automatic or Automation Gaging! And now, these standard P&W Packaged Units . . . with appropriate tooling . . . can provide an installation tailored to your needs *without* the expense or delays required to engineer and construct special controls.

For example, these P&W Packaged Units made it easy to provide automatic on-machine gaging for this special, high-speed automotive piston machine produced by LaSalle Tool, Inc. Two P&W Air-O-Limit Carbide Gage Plugs are arranged to check the ID of both wrist pin bores on the pistons automatically. Lights on the P&W Control Units signal the operator if tolerances are exceeded. A second set of gage plugs similarly checks bores for the presence of snap ring grooves. If desired, control units can be arranged to shut down the machine automatically when an imperfect part is detected. Whatever *your* requirements, P&W can supply gaging equipment exactly right for the job.

For complete information, write to Pratt & Whitney Company, Incorporated, 11 Charter Oak Boulevard, West Hartford, Connecticut.



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MACHINE TOOLS • GAGES • CUTTING TOOLS

WENDT-SONIS tools cut
fast and clean . . . stay sharp

The difference is in the finish!
All Wendt-Sonis drills, reamers, counterbores and other round tools are 30% smoother by profilometer readings. Flo-Finish, an extra operation applied after final grinding, practically eliminates grinding marks.

30% smoother Flo-Finish reduces chip friction — permits faster chip flow away from cutting edges — faster feeds and speeds. Lower chip friction also means less tool-damaging heat with a resulting increase in tool life. In addition, less power is required, and work finish is improved — in some cases by an average of 50%.

Micro-photograph (right side) shows how Flo-Finish eliminates grinding marks.

For detailed information on Wendt-Sonis tools, for competent technical assistance on tooling problems, see your Wendt-Sonis distributor's salesman.

Send for free 94-page Catalog No. 56—Address Dept. AM-157

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Hannibal, Missouri • Rogers, Arkansas

NEW SHOP EQUIPMENT

can be used for horizontal and vertical spindle surface grinding, tool and cutter, and cylindrical and internal grinding of hard and soft steels, carbides, brass, aluminum, copper.

Electro Refractories & Abrasives Corp, Buffalo, N Y

Prefabricated brazing rings in Nicrobraz line are intended for use with stainless-steel tubular assemblies of all kinds. Rings are available in alloy grades to suit any need and can be made for use with standard or special tube sizes or shapes. Dimensional tolerances are guaranteed within 0.001 in. Rings are designed to slip over the tube to be brazed, thus simplifying and speeding fabrication operations.

Wall Colmonoy Corp, 19345 John R St. Detroit 3, Mich

Boring tool for light-gage metals and fiber boards, called Roto-Bor, is offered in 54 stock sizes covering range of 3/16 to 1-9/32 in. Tool is available singly and in sets of 10 in a hinged-top box. No torque is developed by tool, and work may be hand-held without vises or clamps. An axially retracting center point assures accurate positioning. Tool operates in portable or stand drills at twist-drill speeds.

Jancy Engineering Co, 508 S Pine St, Davenport, Iowa

Guide pin bushings in 26 standard sizes are precision machined and provided with double figure-8 oil grooves on the inside for efficient lubrication. Alemite lubrication fittings are optional. There are also 16 standard sizes available rough-bored and faced, finishing to be done by the user. Bushings are made of WW175 metal, an aluminum-bronze alloy. Bulletin 15-404.

WW Alloys, Inc, Div of Fansteel Metallurgical Corp, 11644 Cloverdale Ave, Detroit 4, Mich

Humphrey-Wilkinson Safety Device Warns Against Overheating

Safety device called Heat Warner consists of a brass cartridge filled with pungent gas or smoke under pressure. It releases acrid smoke when "hot boxes" or other friction points in machinery develop dangerously high temperatures, warning of trouble before damage occurs.

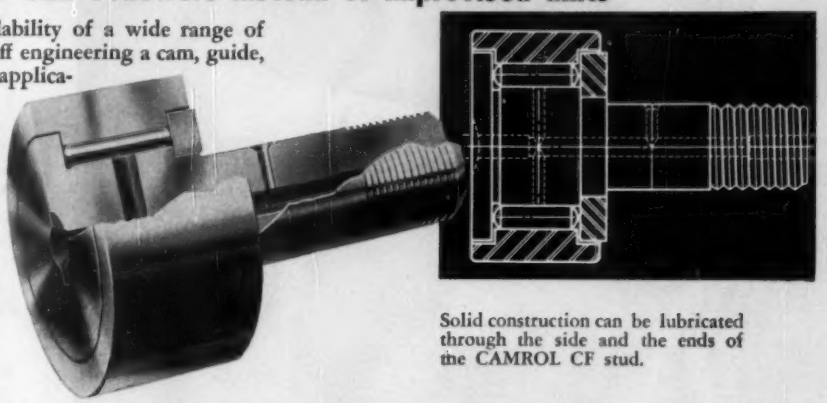
Humphrey-Wilkinson, Inc, North Haven, Conn

BEARING TIPS by McGill

For convenience, with savings in time and cost

Use McGILL® CAMROL Cam Followers instead of improvised units

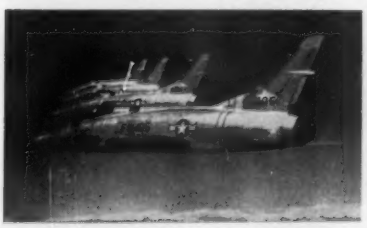
Simplification of design with availability of a wide range of standard bearings takes the strain off engineering a cam, guide, support or track roller bearing application. No need to "build up" a special unit when you can select the proper size standard CAMROL bearing engineered especially for the job. McGill's CAMROL bearing construction offers full type capacity, with provision for shock, in a compact precision unit. Specify CAMROL, the original cam follower, in either CF (with stud) or CYR (shaft mounting) series. Sealed and prelubricated bearing available also.



Solid construction can be lubricated through the side and the ends of the CAMROL CF stud.

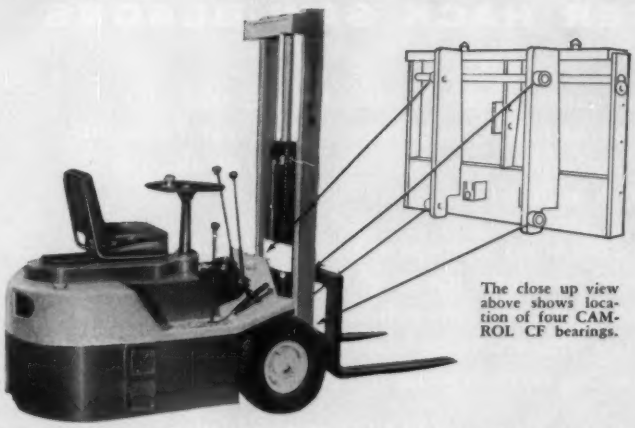
CAMROL YR bearings help F-100 Super Sabre make slower and safer landing

The supersonic speeds obtained by today's modern aircraft set up design problems not encountered with older, slower planes. The overall streamlined design required for speed in flight, for instance, necessitated finding ways of supporting the North American F-100 Super Sabre at low air speeds required for landing. A



series of slats on the leading edge of the wing, providing greater lift at lower air speed, was the answer. Each slat is supported by McGill CAMROL YR bearings — especially designed to permit shaft or yoke mounting. These long-life bearings carry the loads of these slats as they move on tracks during flight of the Supersonic F-100.

CAMROL CF bearings out-perform friction rollers as fork support bearings



The close up view above shows location of four CAMROL CF bearings.

Small size and high load-carrying unit construction with simplified lubrication are among principal benefits obtained by Hyster Company from use of CAMROL CF bearings as fork support rollers in its Hyster 20 and other lift trucks.

Two bearings ride up and down inside each vertical mast section to position the lift truck fork under load. Speeds are relatively slow but the crushing loads on each bearing are heavy.

In this particular application, the exterior surfaces of the bearings are treated with a black oxide finish. This provides corrosion-resistance which serves to augment maintenance-free operation, a characteristic of CAMROL bearing construction.

Fact-packed Bearing Catalog

Write for your copy of Catalog 52-A, a revised, 128-page Bearing Selection Guide.

Insure performance with McGILL®

MULTIROL® GUIDEROL® CAMROL
Precision Needle Bearings

McGILL MANUFACTURING COMPANY, INC., 300 N. LAFAYETTE ST., VALPARAISO, INDIANA

...WITH LENOX MO-SPEED® POWER HACK SAW BLADES

Here is a power hack saw blade that can take it! Power-packed steel, tough-wearing teeth, and straight-cutting performance gives you increased production rates with minute tolerances.

Made of the finest high-speed steel, the LENOX Mo-Speed bites into the toughest materials, takes full-rounded chips, eats through hard spots. You'll spend less time changing blades, get straighter cuts, and boost cutting records when you switch to Mo-Speed.

There are three types of LENOX power blades designed to fit your particular cutting needs. Call or write today for full information.

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THE TOOLS IN THE PLAID BOX

AMERICAN SAW & MFG. COMPANY
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NEW SHOP EQUIPMENT

Welding wire, a mild steel copper-flashed product designated Type MS-21, has been developed primarily for use with CO_2 shielding gas, and may also be used for inert gas welding. Available in four diameters, 0.040, 0.0625, 0.077, and 0.091 in.

Westinghouse Electric Corp, PO Box 2099, Pittsburgh 30, Penna

Tiger conveyor pulleys, precision-machined all steel construction, are available on even diameter and may be obtained in pipe size diameters. Pulleys have extra heavy rim thickness; oversized bores and hubs; larger than standard listed face lengths.

Rockwood Pulley Manufacturing Co, 20 Crosby St, New York 13, N Y

AGASTAT time delay relays are available with dial head adjustment. Four timing ranges are 1/10 to 3 sec, 1/10 to 10 sec, 10 sec to 2 min, 30 sec to 15 min. Each unit is adjustable within these ranges; complete adjustment is attained by one revolution of the dial.

A'G'A' Division, Elastic Stop Nut Corp of America, Elizabeth, NJ

Blake flute grinders are now equipped with air-operated vertical slide; operator merely controls depth of grind. Older units with hand-operated vertical feed can be converted by the factory.

Edward Blake Co, 437 Cherry St, West Newton 65, Mass

Release agent, Sonite Seal-Release, to facilitate parting of epoxy resin castings from plaster molds, or from metal, wood, or epoxy masters, can be rubbed down to a thin film after application. Product which seals surface pores can be rubbed, brushed, or sprayed on.

Smooth-On Manufacturing Co, 572 Communipaw Ave, Jersey City 4, N J

Liquid rubber paint, Apco, adheres to metal, wood, plastic, and concrete. Applied by brush or spray, it reportedly dries in 20-30 minutes, provides protection against corrosion, moisture, acid or alkali, solvents.

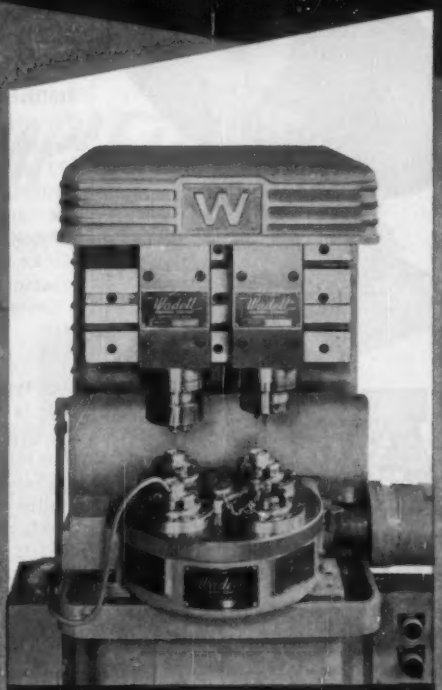
Adhesive Products Corp, 1660 Boone Ave, New York 60, N Y

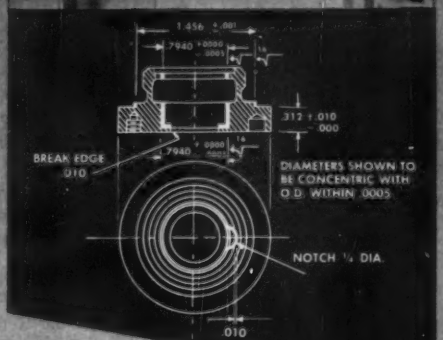
"660" drill kit contains set of tools for handling difficult drilling operations. Tools, in addition to making

NO TIME LOST LOADING AND UNLOADING

using an
automatic index set-up
on the WADELL
VBM automatic

Operator can load and unload workpieces into the chucks or fixtures while the machine is cycling automatically. This set-up on short cycle time operations can easily increase production output as much as 50%. Wadell engineering and standard tooling components can provide you with a "PRODUCTION PACKAGE" that will meet your most exacting requirements for accuracy and speed. Completely automatic machines including loading and unloading with automatic gaging can be furnished.



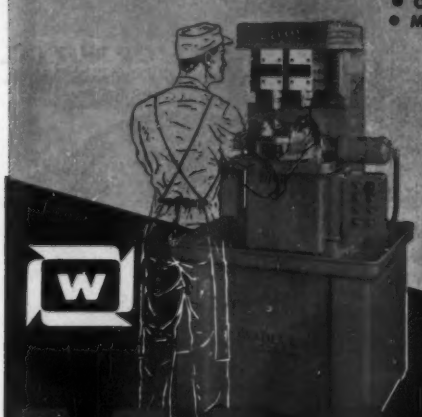


Actual installation at large *West Coast manufacturing plant.

- **OPERATION:** Bore, turn and mill.
- **MATERIAL:** Aluminum Alloy 11ST.
- **TOLERANCES:** As shown.
- **PRODUCTION:** 360 pcs/hr at 100% efficiency.

* Name on request.

Machined as indicated by heavy lines.



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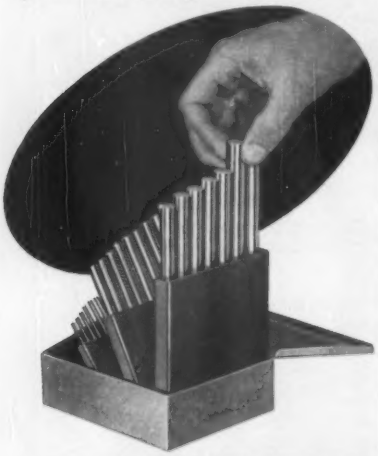
Now available in 182 standard sizes to meet your exact requirements



ACE

hardened high speed steel

DRILL BLANKS

These versatile, low-cost drill blanks are made of top quality, uniformly hardened high speed steel precision ground to exacting tolerances to meet the requirements of countless applications. Ideal for use as dowels, punches, knockout pins, gages, and rollers. Readily adaptable to form a wide variety of end cutting tools, too. And they're offered now in 182 standard stock sizes and in sets as shown.

Call your local Ace Drill Distributor today!

NEW CATALOG covers the entire line of Ace "Ground-from-the-Solid" High Speed Steel and Carbide Drills, Reamers, Drill Blanks and Special Drills. Send for it today!

ACE DRILL

ADRIAN, MICHIGAN

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

NEW SHOP EQUIPMENT

it possible to use broken drills, add 10 in. or more to regular length drills. Set is furnished in a steel box; Price is $19.75.

Ritmar Corp, 183 New York Ave, Huntington, N Y

Stellite-faced, rotating valves are now standard equipment on Lincoln Electric's air-cooled, engine-driven, 180 and 250-amp welders. Valve wearing surfaces are faced with stellite and then, in operation, are rotated approximately 8° on every stroke of the engine to insure even wearing.

Lincoln Electric Co, Cleveland 17, Ohio

Dry-type air filter, designated Multi-Pak, is designed for applications that require filters of standard construction but higher than normal cleaning efficiencies. Variety of renewable media ranges from cellulose fiber sheets through dense glass fiber mats. A 2-ft by 2-ft by 22¾-in. unit contains 50 sq ft of filter material in seven pockets. Bulletin 237.

American Air Filter Co, 215 Central Ave, Louisville 8, Ky

MP HI-Temperature lubricant reportedly does not thin out up to approximately 600 F at which point it is transformed from fluid to gas; at –60 F it remains fluid. Product is said to be particularly effective when applied to bearing surfaces subjected to heavy pressures and loads.

Tower Oil Co, 300 W Washington St, Chicago 6, Ill

Screw control that provides sensitive speed adjustment on Zero-Max variable speed reducers is available as optional equipment on new units or in kit form for installation on Z-M's now in service. Fifty revolutions of the screws cover full range of speed from zero to maximum making it easy to calibrate for fine adjustment. Price is $9.

Revco, Inc 1900 Lyndale Ave S, Minneapolis 5, Minn

Pedestal base cabinet for Logan 12, 11, and 10-in.-swing lathes is available in two styles; one, with a door covering three storage compartments or shelves inside the right pedestal; the other with three pull-out drawers with individual locks. Both models have wide, deep chip pan.

Logan Engineering Co, 4901 W Lawrence Ave, Chicago 30, Ill

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Faster assembly . . . no more failures of fasteners. GREER STOP NUTS hold firm against jolts, shocks, shimmy, wobbles . . . any vibration, any kind.

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Stop Nuts

"RODGERS PLATEN PRESS GIVES US

FAST CYCLING WITH COMPLETE SAFETY"

—SAYS VEIT AND YOUNG

Rodgers 400-ton platen press in use at Veit and Young, Huntingdon Valley, Pa., metalworking specialists. The press is equipped with die cushion, fast cycling cylinders and other accessories. Some of the products formed are stacked by the press.

Higher, more consistent press cycling rates are maintained by Veit and Young press operators with the safety controls used on their Rodgers Platen Press. Complete operator-confidence in these safety controls means they can concentrate on speed and accuracy! At Veit and Young's Huntingdon Valley, Pa., plant they're working with type 303 stainless steel, brass, carbon steel and aluminum. Stock thicknesses range from 1/32" to 1/8" with bends up to 90°. Production has increased in the drawing and forming of large serving trays and electrical panels.

Fast cycling of this Rodgers Platen Press is made possible by auxiliary cylinders. They lower the big platen quickly to the die contact—raise it equally fast after die disengagement. Forming pressures can be pre-set from 80 to 400 tons. Holding pressures on the pneumatic die cushion range up to 50 tons! Veit and Young changes dies in an hour or less.

Rodgers Electro-Hydraulic Control System governs all platen, pressure and time cycles with simple, fast adjustments—for increased output! If you work in metal, plastics, rubber, veneers,—you can mold—draw—form *faster* with a Rodgers Platen Press. Capacities 10 to 600 tons, with plain or heated platen, up or down action, controls and accessories to suit your needs. Tell us your production requirements and send for Rodgers "Blue Ribbon" Platen Press Catalog.

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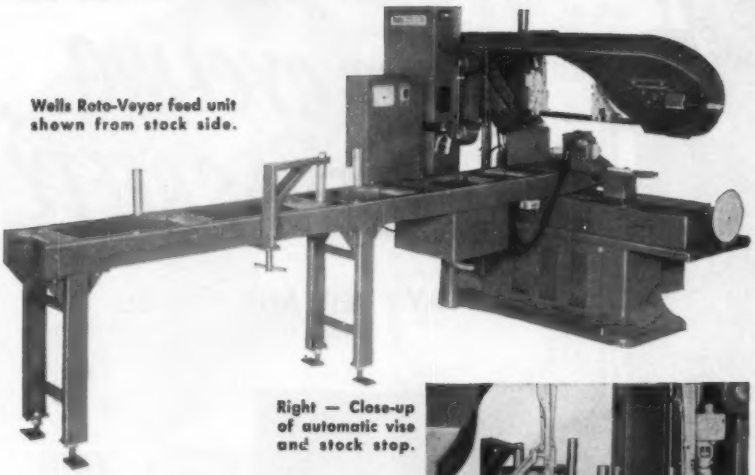
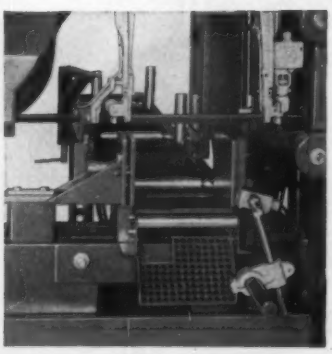


Wells Roto-Veyor feed unit shown from stock side.

Right — Close-up of automatic vise and stock stop.



The New *Wells Roto-Veyor* AUTOMATIC BAR FEED

DESIGN FEATURES

- Heavy duty construction—enclosed steel channel side rails. Welded leg sections—adjustable feet for leveling, drilled for anchoring.
- Manual control (forward-reverse) switch for fast, convenient job set-up, or stock removal.
- All conveyor feed rollers are mechanically powered—electrically controlled.
- Unlimited projection length.
- Automatic work vise, hydraulically actuated.
- Positive stock stop, hydraulically operated, swings out of way during cutting operation.
- Extension conveyor sections, available in 10 ft. multiples, powered by basic unit feed drive.

The Wells Roto-Veyor is an entirely new concept in automatic bar feeds. Designed specifically for use with the Wells Model 1200 Band Saw, the Roto-Veyor converts it into a heavy duty completely automatic cut-off machine.

The Roto-Veyor feed mechanism and stock clamping action is synchronized with the saw to provide accurate repetitive cutting. It improves the saw's efficiency, saves time, and reduces production cutting costs.

SPECIFICATIONS

Capacity:	
Rectangular	12" x 12"
Rounds	12¾" O.D.
Maximum length of multiple cuts	Unlimited
Projects within 7" end of stock	
Height, floor to conveyor	28"
Overall height of feed unit only	46½"
Floor area in addition to saw	88" x 24"
Shipping weight, approximate	705 lbs.

Let us send you complete information — write today.

Wells SAWS

Wells

The Pioneers of Horizontal

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
505 ROOSEVELT ROAD, THREE RIVERS, MICHIGAN

ROUND TABLE *Discussion*

WARNING: SICK LEAVE A'COMING

Could a plan be worked out whereby the men in the shop would tell their foreman in advance that they intend to take sick-leave days off for purposes other than illness? Would the knowledge help the foreman?

ON TOP of the multifarious duties and innumerable headaches heaped on the shoulders of the already harassed foreman, our executive brain, Al, comes up with the idea that the supervisor be a qualified clairvoyant. Al wants him to see into the future so that he may estimate time likely to be lost from the production schedule. Would you have the foreman furnish himself with a crystal ball, Al, or would you have Harrison OK a purchase order through regular channels? This being the gravy era I see no reason why he shouldn't get in on it and get a large spoonful at company expense.

The sick-leave plan was originally conceived to assist the worker financially in the event that he happened to cave in physically. While every little bit helps out in such an emergency it really doesn't amount to much for the poor sucker who gets into the ring with a member of the medical profession—be he a member of the Blue Cross, Yellow Cross, or

"Sorry, Mac, but this locker's occupied!"

Double Cross notwithstanding. If he gets a pain in the side he is knocked for a cocked hat and whittled at to the tune of two or three hundred bucks. It can readily be seen that the liberality of his employer, in allowing him four or five days with pay for being off work will not scratch the bottom of his troublesome barrel.

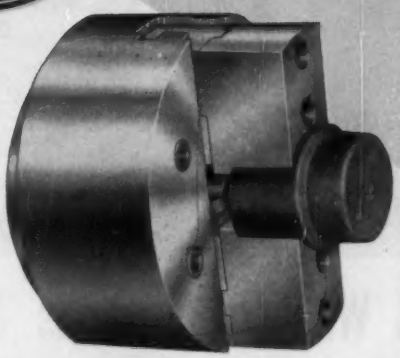
Not all workers are blessed with a pain in the side and have to content themselves with other means of extracting this affection from their employers. This dipping into the gravy boat has been going on now for some time and is about to be permanently established as a policy. You, as an employee, have taken things for granted, assuring yourself that you are entitled to your sick leave whether you are physically indisposed or not. This should be a great thing for the employer who certainly should be given credit for it on his income tax—it's a gift. Might as well be given credit for a gift as to be rooked.

Let's get to the point of Al's idea of getting the men to tip off the foreman as to when they plan to take sick-leave days off for purposes of monkey business inasmuch as they don't exactly know when they are going to be sick. This is not so startling as it may sound. While they don't tip off the foreman about it at present, they do have it in their own minds to "be sick" in some form or another at some future date. Al wants to get the lowdown so that he can pass the word on to Harrison, but I don't think the men will fall for it and I'm certain that the big shot will wonder what's cookin'.

I've heard cracks coming from workers to the effect that they were going to do so and so for a couple of days as they were certain that they wouldn't use up their allotment of sick leave before the end of the year. These fellows happened to be indestructible bruisers endowed by their Creator with rugged constitutions. The timid weakling, the Milquetoast character who catches a cold in the presence of a humming bird, can't afford to risk his savings account with such rash moves. It seems to be the general opinion now that a worker is entitled to his days off whether he is sick or suffering a hangover.

Why should a conscientious sucker suffer the pangs of remorse because he slips a fast one over on the boss, while the general run of industrial gangsters play around at the expense of the firm to the tune of Rock and Roll? No, Al, Ed is right when he says that you can't expect a man to

POWER CHUCKS



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S-P SELF-CENTERING CHUCKS are built in Universal American Standard models, sizes 6" — 8" — 10" — 12", and Serrated models in 8" — 10" — 12" sizes. Two or three jaws.

S-P COMPENSATING CHUCKS grip out-of-round work with equal pressure on each jaw. Available in 8" — 10" — 12" sizes, two and three jaw models, American Standard or Serrated.

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S-P Power Chucks are installed as original equipment by Bardons & Oliver, Cleveland Automatic, Cone Automatic, Ex-Cell-O, Jones & Lamson, Monarch, Warner & Swasey . . . and many others. Representatives in principal cities. Prompt deliveries. Send for catalog No. 105. The S-P Manufacturing Corporation, 30201 Aurora Rd., Solon, Ohio.

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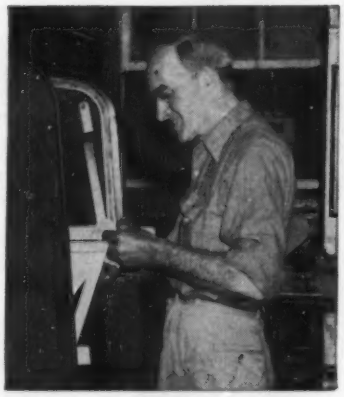
Universal Winding Co. Cuts Tool Costs With McCaskey Tool Crib Control

Since installing McCaskey Tool Controls, the Universal Winding Company of Cranston, R.I. reports a big improvement in shop efficiency and major reductions in operating costs.



Mr. J. W. Egan, Tool Supervisor, says McCaskey Methods have been used since 1952 in the two main tool cribs for both their textile twisting and winding machines and for their electrical coil winding machines. He high-spots the benefits:

"McCaskey Tool Crib Control has not only tied responsibility for specific tools to each employee but has enabled us to get a monthly report on worn and damaged tools which are charged to each department. Also, tool crib operation has been speeded up now that the location of all tools on the floor can be readily determined."

Mr. Egan adds: "By disclosing dead and infrequently used tools, as well as any excessive inventory of active items, McCaskey has enabled us to cut our overall tool inventory and save considerable money."

Comparable operating savings can easily be yours. McCaskey has Tool and Gage Controls and specific control systems to offer money-saving benefits regardless of your products, or the size of your plant.

Find out how McCaskey eliminates such costly operating expenses as tool loss and theft, high breakage, unbalanced inventories, and production delays. Mail coupon today for free booklet. No obligation, of course.

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Please send me your new booklet: "How Tool Costs Were Cut 12 Ways in 20 Plants."

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admit that he's taking time at the company's expense ahead of time simply because it isn't human nature for one to stick one's neck out unnecessarily.

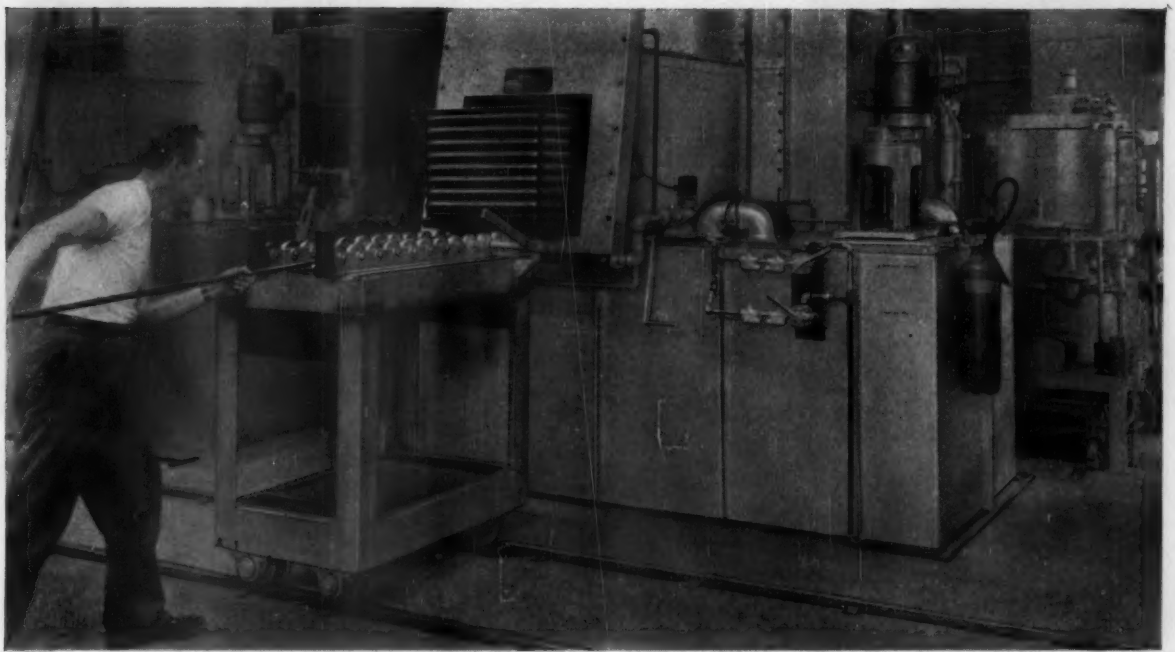
Why can't we promote the cause of honesty in eliminating the present condition by facing the facts? The employer and the employees know that the present setup is phony and abusive. Why not allow the worker five days for any emergency that may arise—be it sickness or pleasure? Surely five days of pleasure for the employee will be to the benefit of the employer in the long run. This would eliminate the tendency to dishonest practice and at the same time enable the foreman to be open and above board about what to expect his men to do in advance. It would diminish any loophole whereby a double-cross could be pulled off at some future time.

J Homewood
Laguna Beach, Calif

THIS discussion I consider timely since it bears on something that happened in our department at work just recently. A man needed two days off in the coming week for some personal work on his home. He requested leave, was refused, argued the point, then was allowed one day off. But he is still resentful. He will not lie, and make believe he's sick, and thinks this sort of thing isn't necessary.

Why doesn't management change its policy of tieing a day off in with a leave of absence? Why have a setup that fosters moral decay? There are too many falsehoods (sometimes called white lies) being told now and rationalized by saying they don't hurt anyone, or perhaps explained

"Of course my wife gets up when I do . . . Who do you think gets her breakfast?"



MRX® gas generator (right rear) supplies an Alloase® furnace

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For low capacity heat treatments that can be benefited by a prepared atmosphere process, Surface® offers three different types of standard generators. Each type is available in three different capacities ranging from 150 to 800 cfh.

The MRX® gas generator (shown above) produces an endothermic atmosphere, which can be enriched.

The MDX® gas generator produces an exothermic atmosphere, which can be varied from oxidizing to reducing.

The MAX® gas generator produces a dissociated ammonia atmosphere.

Each of these generators is a packaged, catalogued assembly. Engineering costs have been spread over many units, performance is pre-rated, delivery is quicker.

Each can be manifolded to a battery of furnaces.

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away by saying that what one doesn't know won't hurt him.

The Round Table discussion admits that Harrison (representing management) doesn't like to grant even short leaves of absence. Clearly, it's the men's loss of pay if they lose time at work. Perhaps plant overhead does increase per man as absenteeism increases, and also production may drop. But what about the evil of employee turnover? If the employee is unhappy he'll quit sooner or later.

I believe that keeping good men from quitting and keeping their loyalty, cutting turn-over, encouraging honesty, should be the principal aims of managerial policies, rather than a selfish, short-sighted aim of temporarily keeping production on schedule and saving a little on an abstract statistical figure like the overhead per man.

Management should try to gain more good will from the labor force. When labor knows there is nothing to fear from an admission of a coming absence, more accurate estimates of absenteeism will be possible and the benefit of a more stable work force will be substantial.

Edward Diskavich
Torrington, Conn

AL PRESENTS a problem to Ed that is common to the area of production. It is one that has an answer in spite of the knot he ties in it as he presents it to his pal.

This problem involves the making up of an estimate of future time lost by those who delight in attending ball games, fishing the babbling streams, hunting, and other means of

"I keep telling myself I should delegate more of the work to people under me, but I keep forgetting—there aren't any people under me."

GUARANTEED ACCURACY has developed from more than 90 years' specialization with practical metrology. The resulting SIP techniques —as used in length measurements by national Bureaus of Standards—may be most profitably applied with SIP UNIVERSAL & LINEAR MEASURING MACHINES, SIP high precision MICRO-INDICATORS, and SIP PROFILE PROJECTORS. How well these techniques and machines can work to your advantage is illustrated in the film offered below.

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ANOTHER DIAMONITE FIRST

Above: Diamonite Oxide Chip Breaker after removing approximately 368 cubic inches of A.I.S.I. 4140, heat treated to Brinell 270-300, at 500 f.p.m. with .011" i.p.r feed and .350" depth of cut. Note absence of wear or cratering.
Below: Carbide chip breaker after removing same amount of same material at same speed, feed and depth of cut. Note cratering.
Photos enlarged approximately 2½ times.

New DIAMONITE
Oxide Chip Breaker
outlasts other materials...
increases cutting tool life

Sustained accurate positioning of the chip breaker with reference to the tool cutting edge is vital in the ultra-high speed machining possible with oxide cutting tools. Wear and cratering of the chip breaker destroy this relationship, leading to machining difficulties caused by the chip getting out of control.

To maintain uniform chip control, it is necessary to use a chip breaker more resistant to abrasion and cratering.

The new Diamonite Oxide Chip Breaker provides this facility.

Made of the same ultra-hard, highly abrasion resistant materials used in Diamonite Oxide Cutting Tools, Diamonite Oxide Chip Breakers possess resistance to abrasion and cratering many times that of other materials including the carbides. This is graphically illustrated in the photos above and is reflected in greatly extended tool life due to elimination of undue strain on cutting edges.

Because of Diamonite's exceedingly low coefficient of friction and low thermal conductivity, friction heat is practically negligible and the chip breaker does not absorb heat from the chip . . . cannot transfer it to the metal holder. This prevents expansion and contraction of the assembly, maintaining firm, rigid clamping essential to maximum oxide tool performance.

To gain the fullest advantages of high speed material removal, long tool life and the superior surface finish possible with oxide cutting tools, use Diamonite Oxide Cutting Tools with Diamonite Oxide Chip Breakers in the new Diamonite Superigid Tool Holder . . . the only holder designed especially for use with oxide cutting tools. They are available from a nearby Diamonite distributor. If you do not have his name, write

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relaxation too numerous to mention. There is a foggy inference that the days taken off for these rejuvenating activities are likely to be taken because of the sick leave privilege now enjoyed by the worker—the inference being that the men will take advantage of this privilege and become absent from work under the guise of being sick.

While a man may have a general idea about what he is going to do when certain seasons come around, I doubt very much if he will be jackass enough to reveal that he intends playing sick—providing he has sufficient time to his credit. Let us assume that Bill Todd has used up one of his four or five days allotted to him for sick leave with pay and he has a strong yen to take a few days up at a refreshing lake later in the summer. Of course he has a couple of weeks vacation coming but he wants to get in the fishing before that time so as not to interfere with the two weeks with the family. He wants to get this in because he feels that he's entitled to the extra time because he hasn't been off sick for a long time. Al is chump enough to expect Bill to confide this to him so that he can form his estimate of time out in advance! Don't expect a horse thief to fasten a noose on his own neck.

If Bill does take an extra jaunt and gives the impression that he was sick, is he cooperating with his boss to the best of his ability? Or does he think more of a few dollars than he does of principle? Then again the question arises in my mind: Does the foreman place the interest of the company above the convenience of the selfish individual who places his own interests above the welfare of his fellow workers? When the de-

"Well, it takes me there and brings me back."

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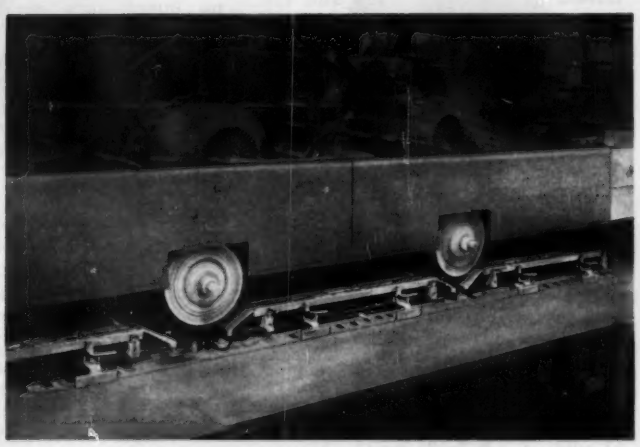
THE bright finish on trim parts that "dress up" thousands of products must start with a perfect, unmarred surface prior to final buffing and plating.

Osborn power-brushing has proven the ideal production method for removing draw marks, blending imperfections as an essential preliminary step, before buffing.

These outstanding results are another reason why Osborn power brushing has gained industry's confidence. An **O**sborn **B**rushing **A**nalysis, made at no obligation, will show how *you* can benefit from this advanced finishing method. Write *The Osborn Manufacturing Company, Dept. C-53, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



A leading manufacturer of trim parts uses 16" diameter Osborn Fascut® Brushes, operating at 1700 rpm, to produce perfect plating surfaces.

Osborn Brushes

partment head connives with any of his men in such a way as to gain information, the knowledge of which is contrary to the principles of integrity, he is putting too much sand in the mortar.

You can't build your house upon the sand and expect it to withstand the elements. The foreman can't expect his men to shoot square in their dealings with him if he in turn acquiesces in what is known by both of them to be a crooked deal. Sound relationships cannot be built from tongue-in-cheek tactics. The foreman must see to it that square dealing is first, last, and always. It would be better for the foreman to turn a deaf ear to the facts, if he hasn't the guts to face them, rather than to be a party to a dishonest arrangement.

Al, how can you consider a thing a private affair between you and any of your men and expect proper cooperation when the affair contains the elements of crookedness and deception? If you even give a hint of cooperation in an underhanded arrangement you are weakening the structure of executive control. The guy will have you over a barrel and believe me he'll take a hell of a whack at your bottom end the first opportunity he has to further his own ends. Better that you listen to Ed and save yourself from what would be coming to you were you to play around with fire.

Robert Roundbottom
Laguna Beach, Calif

LOVERS of the out-of-doors and the tranquil sport of fishing are subject to a peculiar disease when the season for their favorite pastime comes to pass. It is a healthy disease for which there is but one sweet remedy, take a day off and go fishing. The cure is sweet for the fisherman. It is sour remedy for the cost-conscious industrial supervisor.

"He actually doesn't do much work, but he has our other operators so worried they've increased production 30%."

Industrial organizations are also peculiar. Management is ever haunted by its greatest asset, the spirit of free competition. All enterprisers offer the public a better product, at less cost, available on demand. Only those concerns who best keep their promises are successful. Others have plenty of time to go fishing.

A good competitor is cost conscious. No item however small, no condition however trivial, which affects costs is to be ignored. Absenteeism is such a problem. It is a problem to be analyzed, and methods adopted for solution.

The cost of absenteeism is not trifling. A Chicago research and educational organization, according to the New York Times, estimates that if all data were available the loss from absenteeism might be as high as $10 billion a year. Surveys from other sources estimate the rate of absenteeism in industry to be 3% for men and 5% for women. A reduction in the rate of absenteeism or methods employed to reduce its costs will improve the competitive position of an enterprise.

An industrial supervisor may tap the grapevine to learn when certain of his men plan to take sick leave to go fishing. He may then take steps to cut the cost of the absenteeism. This is practically condoning an increase in costs. It is not good management.

In a well managed enterprise there are no unnecessary jobs. There are no unnecessary employees. Every operation is essential to increasing the value of the material being processed. The contribution of every employee affects the competitive position of the enterprise. The answer to the problem of absenteeism lies in the promulgation of this economic truism.

Man is not free. He may have a free will; he does not have a free conscience. Man is not a creature of chance. He is created to do good and avoid evil, to accept his just responsibilities or go to hell. Thus all industrial problems including absenteeism can be solved by giving the worker a feeling of responsibility.

A simple survey will establish this fact, or disprove this theory, as you wish. Check the rate of your absenteeism on your first shift and on your less desirable third shift. One such survey was made. The rate of absenteeism was less on the third shift. Employees, from their own experience, felt they were needed. They

E. F. HENNIS
New York

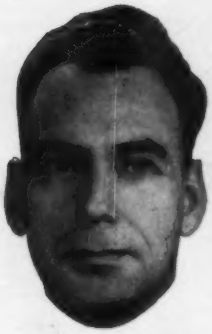
This Panel

RICHARD O. MORIN
Philadelphia

R. H. DYSON
Chicago

C. J. VANDIPTEN
Voorburg, Holland

J. K. AIKEN
Springfield, Vt.



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Their "Category" is Internal Grinding

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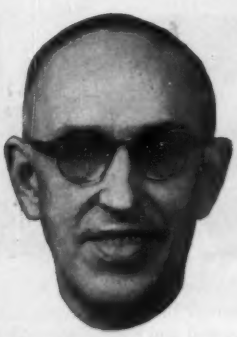

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Ask Them to Solve Your Problem

Phone one of these men at the office nearest you

BRYANT Chucking Grinder Co.

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Internal Grinders • Internal & External Thread Gages • Granite Surface Plates • Magnetic Drums for Computers • Special Machinery

TOMORROW:

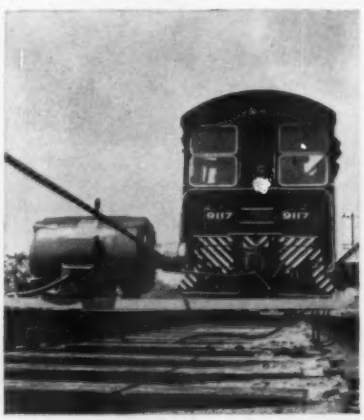
A standard motor that can

The new Life-Line A is another step closer

One of the principal causes of motor failure today is overloading. Right now Westinghouse is working on motor designs that will someday result in a motor that can survive any overload.

This picture shows a 15-hp Life-Line "A" motor pulling a quarter of a million pounds of locomotive on New York Central tracks near Buffalo. It's simply a dramatic way of showing the progress Westinghouse has made toward better overload protection. Improved insulation, frame construction and bearing design give the Life-Line "A" better protection against overloads than ever before. It's industry's closest approach to a standard motor that can withstand any overload condition.

Your Westinghouse sales engineer is ready to tell you about many other reasons why the Westinghouse Life-Line "A" is industry's most advanced and preferred motor. Call him today.



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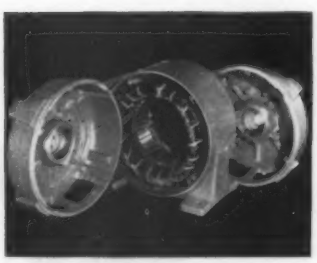
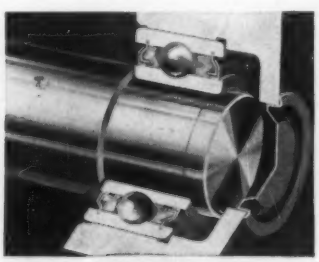


New exclusive Bondite* impregnating varnish, partner to new Bondar* and Mylar† insulations, guarantees complete resistance to the heating effects of heavy overloads as well as motor contaminations.



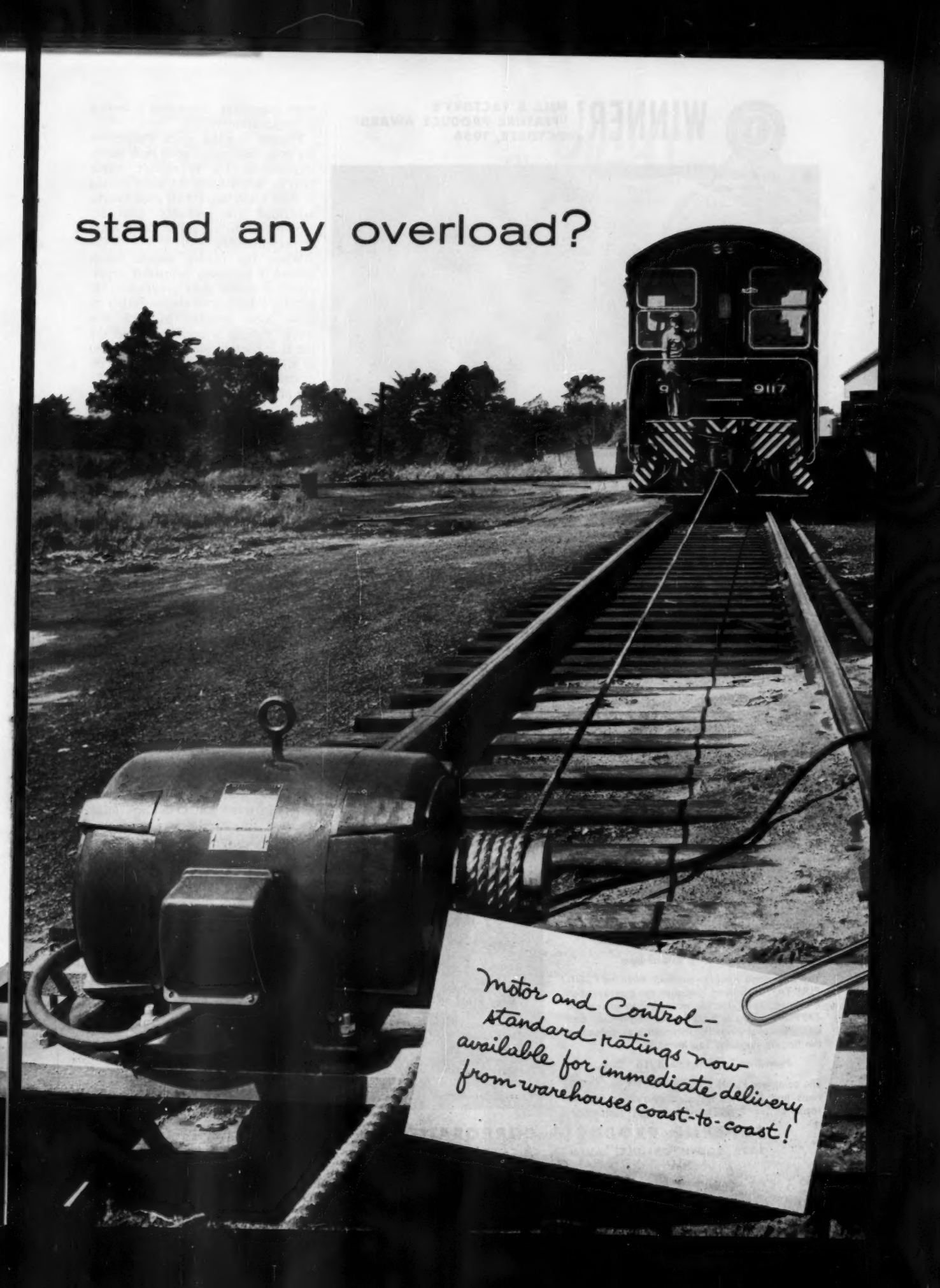
Exclusive Life-Line "A" prelubricated bearing features a new 4-way seal and completely excludes the three main causes of bearing failure: (1) contamination, (2) overgreasing, (3) wrong grease.

*Trade-Mark †Du Pont Registered Trade-Mark

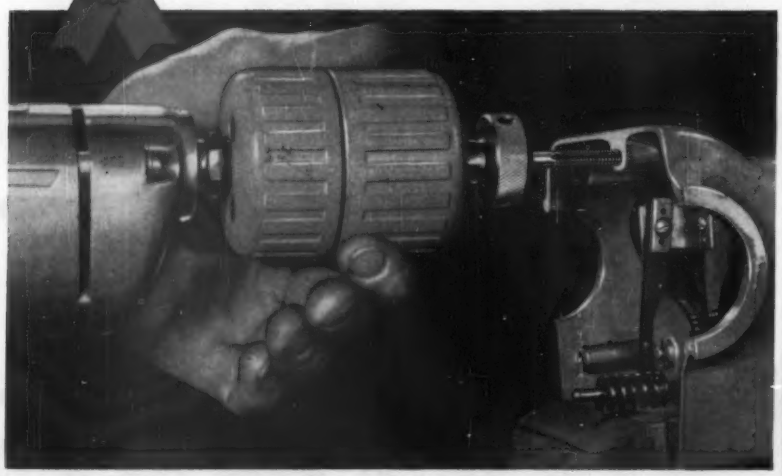
WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING **TODAY!***

stand any overload?



WINNER! MILL & FACTORY'S "FEATURE PRODUCT AWARD" OCTOBER, 1956



SUPREME Push-Pull Tapper

New Power Drill Attachment Taps to Highest Standards . . . Cuts Breakage . . . Lowers Costs

Mill & Factory Magazine's Board of Review has designated Supreme's new Push-Pull Tapper as winner of their "Feature Product Award" for October. This Board is composed of a group of engineers, editors and production experts who each month study hundreds of new items that are being offered to industry for the first time. They select the one product they feel is the most needed by all industry.

The Supreme PUSH-PULL TAPPER is an instant-reversing speed reduction unit made expressly for tapping. It attaches easily to either the spindle or chuck of any portable drill. Detachment after use is equally simple. The speed reduction of 7:1 gives more than adequate power to tap in all materials, and the instant-reversing means that the direction of the tap can be reversed without stopping the drill motor. Thus the tap can be moved into and out of the hole at will.

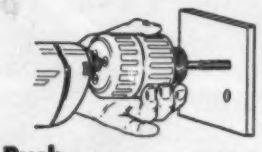
Reduces Tap Breakage

Tap breakage is held to minimum when the PUSH-PULL TAPPER is used, because the operator has a better "feel" for his work. When in use the TAPPER housing is held in the finger-tips, and any unusual strain is felt immediately. Releasing the fingers stops the tap instantly.

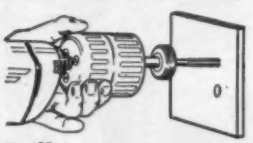
Handles Taps Up to 5/16" Dia.

The complete PUSH-PULL TAPPER Kit, No. 9000, costs just $29.95; includes everything except taps. Order from your Industrial Distributor.

HOW IT WORKS:



Push and the tap runs in smoothly . . .



Pull and it comes out easily . . .

That's all you do—**Push-Pull**

SUPREME PRODUCTS CORPORATION
2222 SOUTH CALUMET AVENUE, CHICAGO 16, ILLINOIS

were important. They had a feeling of responsibility.

Fishing is good sport. Fishermen are good employees, good men. Some corporations try to recruit scarce help by advertising the good fishing in their localities. Of all good sports, fishermen are probably most acceptable to an appeal to their sense of responsibility.

When the fishing season comes around it behooves industrial supervisors to renew their program of instilling a feeling of responsibility in those most tempted to take sick leave. Fishing is important, but the job is important too. Most important of all is a constant effort of every industrial supervisor to instill a feeling of belonging, a sense of responsibility in the employee.

Peter A Seward
Swampscott, Mass

THE PROPOSED idea of having the workers tip off their foreman ahead of time when they're going to take sick-leave days is outside the realm of practicability. How is a worker going to tell his foreman ahead of time if he's going to be sick? And if he intended to take the sick leave to go to a ball game or fishing, would you expect him to admit to his foreman that he's taking advantage of the company and especially ahead of time? The foreman is indeed being naive if he thinks he can get his men to admit to a subterfuge, and then keep it private. If the foreman wants to solve his scheduling problems in the summertime and take into consideration allowed vacations, he

"You'll like this gage . . . is not only gives you the true diameter, but also tells you if this would be a lucky day to play the horses."

should also provide for a fixed amount of sick leave which would include a safety factor of time off for bona-fide employee emergencies.

Most firms have vacation policies where the length of the employee's vacation is based on the number of years of employment with the company. In addition, a stated sick leave program allowing a pre-determined number of days off with pay based on the employee's length of service is the accepted policy with most companies. Any emergency time off other than for illness is charged against the pre-determined sick leave allowance or vacation period. In this manner, scheduling can be accomplished on a more realistic basis without having to guess ahead how many men are going to be out. A work schedule set up in this manner is flexible and practicable.

Al's complaint that some of his men turn their sick leave into extra paid vacations by going to ball games, or fishing, brings up the suggestion that it might be practicable for his company to combine a predetermined sick-leave allowance based on service years with vacation time. That is, it might be economically feasible to grant a paid vacation which includes a fixed amount of sick leave, but with the stipulation that any absenteeism, whether for sickness or for any other reason, will be charged against the combined vacation time allowance.

There is another advantage that will result from the idea of combining vacation and sick leave time, and calling it all vacation. There are many workers whose subconscious minds put them into a sick or semi-sick state on days when they simply do not feel too inclined to work. They seek some subterfuge for staying away from their jobs. Very often, these men look eagerly forward to vacation time, however. If they knew their relatively generous combined vacation and sick leave allowance would be lost, or even lopped in half by getting sick too easily, their subconscious minds would undoubtedly function in the opposite direction, and attendance thereafter would be much more regular.

Harry Kaufman
Philadelphia, Penna

AL SHOULD not be contemplating the idea that it is OK with him if some of his gang plan on taking sick leave when big games are scheduled so

THE RIGHT ANSWER
for greater productivity from machinery investments

Sterling Speed-Trol Variable Speed Motors

Sterling Slo-Speed Gear Motors

Sterling Constant Normal Speed Motors

Sterling Multi-Mount Speed Reducers

Sterling
ELECTRIC POWER DRIVES

The important distinguishing features of Sterling Electric Power Drives can bring greater productivity and cost reductions to your manufacturing operations. To help you meet the competitive challenge of mechanization and automation, Sterling offers you a three-fold answer: Power transmission equipment, variable speed or constant speed —manual or automatic controls —and an application engineering service. Together, these give your machinery the type of drive systems that will achieve maximum productivity at lowest cost.

Write today for Bulletin No. 185. Discover the big advantages Sterling Electric Power Drives can bring to your plant.

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RUGGED

100 TON CAPACITY

Model No. 37K-MD-3

BUILT TO HANDLE LARGER, HEAVIER WORK AT HIGHER TONNAGES WITH EASE

Photo above indicates the heavy construction of bed plates — reinforced to provide maximum rigidity and minimum deflection.

SPECIFICATIONS

Ram Speeds — in./min.	18
Cylinder Bore — in.	7
Ram Stroke — in.	12
Daylight — in./max.	42¼
Opening, L-R — in.	45½
Between Bed Plates	11⅛
Motor, H.P.	7½/220/440-3-60
Shipping Wt. — lbs.	3025

STANDARD EQUIPMENT

1 pair notched V blocks; 1 pressure gauge, dual range P.S.I. and tons on ram; 1 bed adjusting mechanism; 1 flat ram nose; 1 auxiliary 2-speed hand-pump.

You won't have to baby this husky K. R. Wilson hydraulic shop press. Built to tackle the toughest jobs, it's the most rugged standard press of its type available. Heavy-duty, spring-return ram type hydraulic cylinder has a larger bore and longer stroke. This allows the press to handle the big jobs swiftly and safely with a minimum of bed plate adjusting. You get tremendous versatility too! The large, usable daylight opening between side members allows straightening of long pieces. Pressing bushings, shafts, wheels on and off, broaching, bending, coining, forming and drawing operations all can be handled with equal speed and ease. K. R. Wilson Motor Operated Hydraulic Shop Presses are also available in 30, 50 and 75 Ton Capacity. Get all the facts now on these rugged presses!

Get Full Details. Write for Bulletin No. 19

HYDRAULICS DIVISION

K. R .WILSON, Inc.

Offices & Factories — 210 Main St., Arcade, N. Y., U. S. A.

they can attend. Sick leave was never intended for such abuse.

At one large plant the sick-leave arrangement was abused to a considerable extent as shown by the large number of employees who, in some mysterious manner, seemed year in and year out to have just enough sickness to exactly balance their allowable sick leave by the end of every year. The personnel manager claimed this was a condition that all firms were troubled with and there was no satisfactory way out. Some of the fellows who only took sick leave when they actually were too sick to come to work, and one in particular who only had taken five days of sick leave in the 17 years he had worked for the firm, were quite indignant at such evasive trickery and protested directly to the president.

A new personnel manager soon appeared on the scene, one who did not think it a waste of his valuable time to actually pay a personal visit to any employee who sent word that he would not be to work that day on account of sickness.

The house visits paid off; sometimes the personnel manager arrived after the family had left on a fishing trip or for a picnic at the lake, or the painting of the window screens had started, all of which was very embarrassing to the party who had sent in word that he was too sick to go to work. The subsequent drop in sick-leave days off was amazing and in a few months it was so reduced that only persons who were sick, or at least in bed, took their sick leave. Even those who were in bed, were occasionally re-checked in the afternoons if the personnel manager had a suspicion it was a "loafing" sickness.

The time taken to break up this

"I've got insomnia so bad I can't even sleep on the job any more."

Scott Wipers removing oil from outer races of cylindrical roller bearings, for inspection. Scott Wipers are 2-ply—welded together for greater strength—and chemically treated for excellent wet strength. Their special perf-embossed surface and high absorbency make them first choice at SKF for the toughest wiping jobs!

WIPER PROBLEM? Look what SKF Industries did with Scott Wipers!

SKF Industries, Inc., Philadelphia manufacturer of anti-friction ball and roller bearings, wanted a wiping material more dependable, uniform and sanitary than rags. They switched to Scott Wipers.

SKF employees like the convenience of Scott Wipers, easy to grab from a pop-up box. They like the sanitation—and less danger of scratches from clinging foreign particles—when they use fresh, clean Scott Wipers right out of the container.

Management likes the improved housekeeping . . . no more cluttered areas with Scott Wipers so easy to dispose of! And they report that wiping material cost per productive man-hour has been reduced 42%.

Your local Scott representative or distributor will give you more facts—or write: Scott Paper Company, Department AM-71, Chester, Pa.

SCOTT PAPER COMPANY

Makers of the famous Scott paper products you use in your home.
Consult your local TV schedules for Scott's program, "Father Knows Best."

Everybody tells us that

LAPOINTE-BROACHES

are good broaches

Lapointe pioneered the design and development of the now-famous "pine tree" broach, and is still far in the lead in producing all types of broaches for jet engines, and for turbines. We make broaches of every type: carbide-tooth, splines, rounds, flats, rectangular.

(Illustrated: Stationary turbine broach)

They ought to be good! They're designed by broach-engineers with a continuity of experience dating from 1902. That's 55 years, the longest experience of *anybody* — for Lapointe pioneered modern broaching.

LAPOINTE is in the broaching field exclusively. We build nothing but broaching machines, broaching fixtures and broaches. With such *concentration* of broach-engineering, with our entire interest and effort devoted to *broaching*, isn't it rather natural that our broaches should be *good?*

You can use *good broaches*, LAPOINTE-BROACHES, to drive down production costs.

LAPOINTE-BROACHES, Electrolized increase broach life between grinds from 2 to 10 times.

Write for BOOKLET No. 2
"How to care for BROACHING TOOLS"

THE LAPOINTE MACHINE TOOL CO.
HUDSON, MASSACHUSETTS — U. S. A.
In England, Watford, Hertfordshire
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

LAPOINTE
known to be the best in
BROACHING

dishonorable practice was more than well paid for. The personnel manager also was a wide awake fellow who quickly noticed such things as lamp bulbs with the company's mark on them in use in living room fixtures; twist drills, wrenches, screwdrivers and other tools with the company's stamp upon them were noticed around some of the homes and particularly in the "Do it yourself" work corner of the garages.

A little serious talk about this type of" borrowing" still further reduced some miscellaneous expenses and the plant soon was running on a more satisfactory basis. The thorough checkup system, however, is still maintained.

George P Pearce
Albuquerque, N M

COSTS SCHOOL FOR FOREMEN

Can a training program on shop costs benefit a foreman, or is it a waste of time for an old-liner who feels he knows his own department's costs inside out.

Not only should Ed take the training course on costs with grace, he should take it with humility if he knows as little about the subject as many foremen I've met. Unless a shop foreman has more than a nodding acquaintance with costs he is not the complete production executive. Too many shop foremen seem to think that if they produce a good job, that's all that matters, when it's only a part of what matters. Those remarks apply with special force to the general production and repair shops where every other job is different from its predecessor.

In the big plant engaged on repetition or mass production, costs can

"I know he's lazy, shiftless, and incompetent but he looks like a foreman."

Consider your press operator when you consider an O.B.I.

We've talked to a lot of press operators about our Clearing O.B.I.'s. "We like them," they tell us, "they're easy to run. Quiet. And you have a feeling that they can't go wrong on you." Frankly we listen real good to a press operator because he can tell us a lot about our equipment. In fact, the safety designed into our O.B.I.'s—the simple cleanliness of the design, the accessibility of controls—these things were figured from the needs of the man running the machine.

The quiet operation that operators like—well that's just a function of fine construction of Clearing O.B.I.'s. Sort of a bonus factor you might say. Next time you see a fellow running a Clearing O.B.I., ask him how he likes the machine. It's an important point. An operator who likes his equipment will do a better job. If he feels safer, his morale is better. These things mean improved production, a happier shop. And a happy shop is usually a profitable one.

Find out why people prefer Clearings. Write for our fact-filled catalog. No obligation.

CLEARING PRESSES THE WAY TO EFFICIENT MASS PRODUCTION

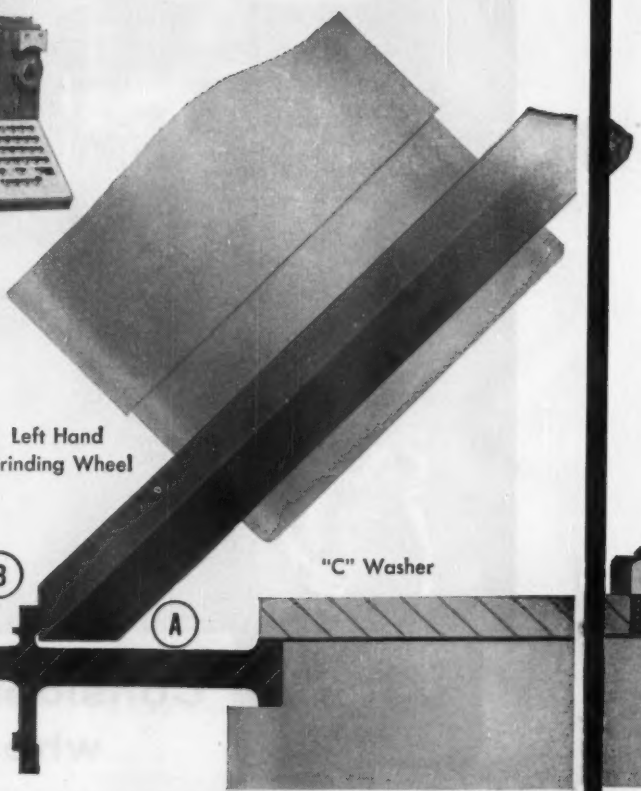
CLEARING MACHINE CORPORATION

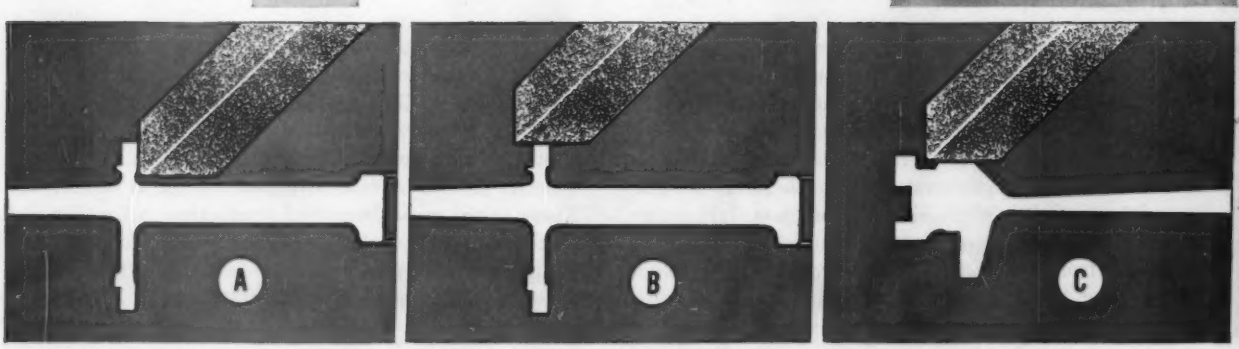
6499 WEST 65th STREET • CHICAGO 38, ILLINOIS • HAMILTON PLANT, HAMILTON, OHIO

Division of U. S. INDUSTRIES, INC.

Multiple Grinding Operations

Frauenthal 1800 Series tolerances . . . assures





Jet engine part is set up on steel parallels and securely clamped to center pilot with large "C" washer.

Rigid mounting and proper alignment assures a high degree of accuracy in parallelism and roundness. Left hand grinding wheel grinds one diameter and three related surfaces to extremely close tolerances.

Frauenthal Division

in One Set-Up

Double Head machine finish grinds 6 surfaces to close concentricity of related surfaces...reduces grinding costs

As ILLUSTRATED in the schematic diagrams, three different diameters and three related surfaces of a jet engine component are precision-ground square and concentric with one another in a single setup using two grinding heads. This is a typical example of how a Frauenthal 1800 Series Double Head Grinder cuts grinding costs.

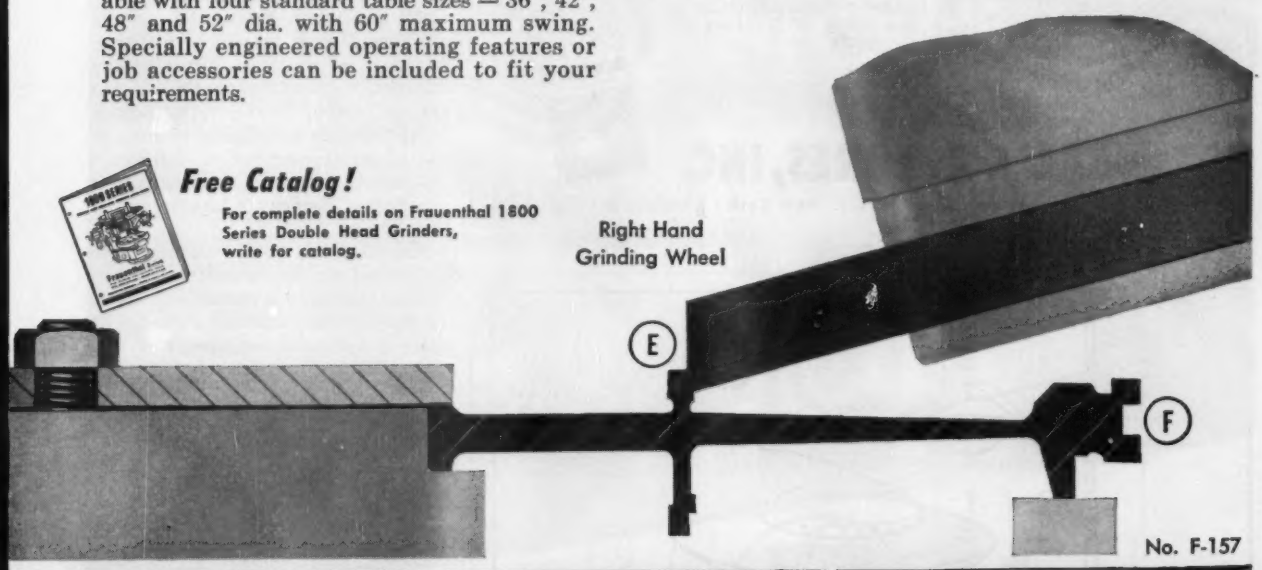
Frauenthal 1800 Series Grinders are available with four standard table sizes — 36″, 42″, 48″ and 52″ dia. with 60″ maximum swing. Specially engineered operating features or job accessories can be included to fit your requirements.

With Frauenthal Grinders (1800 Series or 2200 Series) you're able to grind a number of related surfaces (up to 140″ dia.) without changing setup of workpiece, and obtain accuracies within .000200″. This assures you *consistently* uniform precision in concentricity, parallelism and roundness.

For complete details, contact Frauenthal of Muskegon.

Free Catalog!

For complete details on Frauenthal 1800 Series Double Head Grinders, write for catalog.



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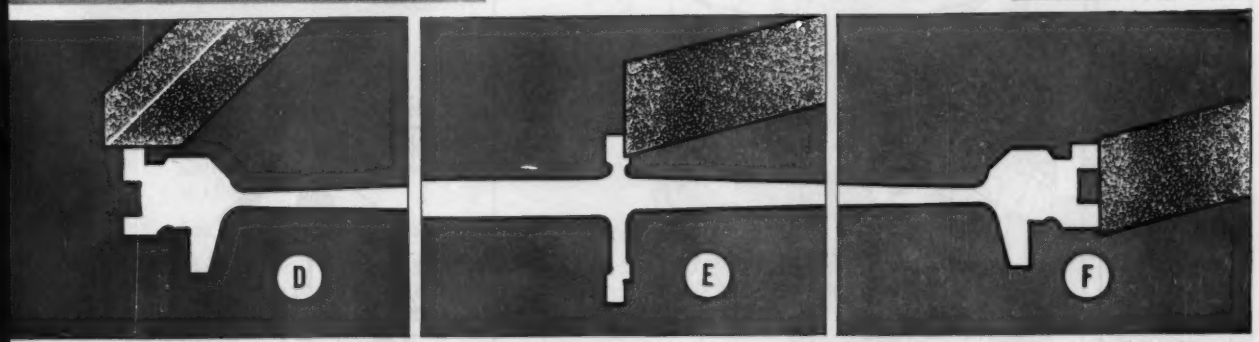


Starting from center of workpiece it finish grinds INNER diameter "A", and TOP FACES "B", "C" and "D". Right hand grinding wheel finishes OUTER diameters "E" and "F". Both spindles are swiveled for accessibility to the workpiece surfaces. All surfaces of jet engine part are ground within .000200″.

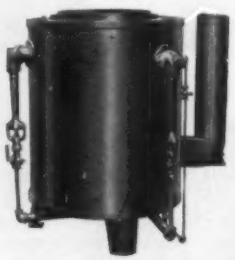
THE KAYDON ENGINEERING CORP.

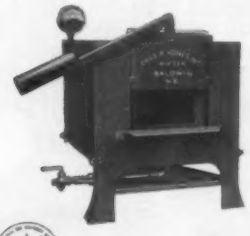
MUSKEGON, MICHIGAN

BUZZER
REG. U. S. PAT. OFF.
INDUSTRIAL GAS EQUIPMENT
BURNERS & FURNACES (Heat Treating, Melting, Soldering)

NO BLOWER OR OTHER POWER NEEDED
. . . just connect to gas supply!

Outstanding service since 1911! Each unit, with the famous "BUZZER" Venturi, delivers the hottest, quickest heat attainable without a blower. Full range control of heat and turn-down. Standards or specials available for manufactured, natural or liquefied gas applications.





ATMOSPHERIC POT FURNACES for cyanide, salt bath and lead hardening — temperatures to 1650° F.

BENCH TYPE OVEN FURNACES for heat treating and pre-heating temperatures to 2000° F.

WRITE FOR NEW "BUZZER" CATALOG

CHARLES A. HONES, INC.
121 S. Grand Avenue, Baldwin, L. I., New York • BAldwin 3-1110

generally be taped from day to day and, due to familiarity with the product, the production potential, within reasonable limits, is an open secret. Where piecework operates, production times are fixed by capable rate fixers, frequently in consultation with the operators, and production times are the important factor in costs so far as a foreman is concerned. Handling times, the economical use of materials, storage arrangements, proper and orderly use of floor space, machine downtime, etc, all cost money and affect the costs.

Even if Ed does know what it costs to run a given part through his section, it would do him no harm to hear what the costs experts have to say. He would probably take a keener interest in the factors, other than production times, which go to make up costs. He might even learn something about how to cut the corners of those factors to which, hitherto, he may have given little serious thought. He would probably get the subject of shop costs into its proper perspective. A knowledge of costs is an essential part of a foreman's equipment and every foreman should grasp the chance to acquire such knowledge.

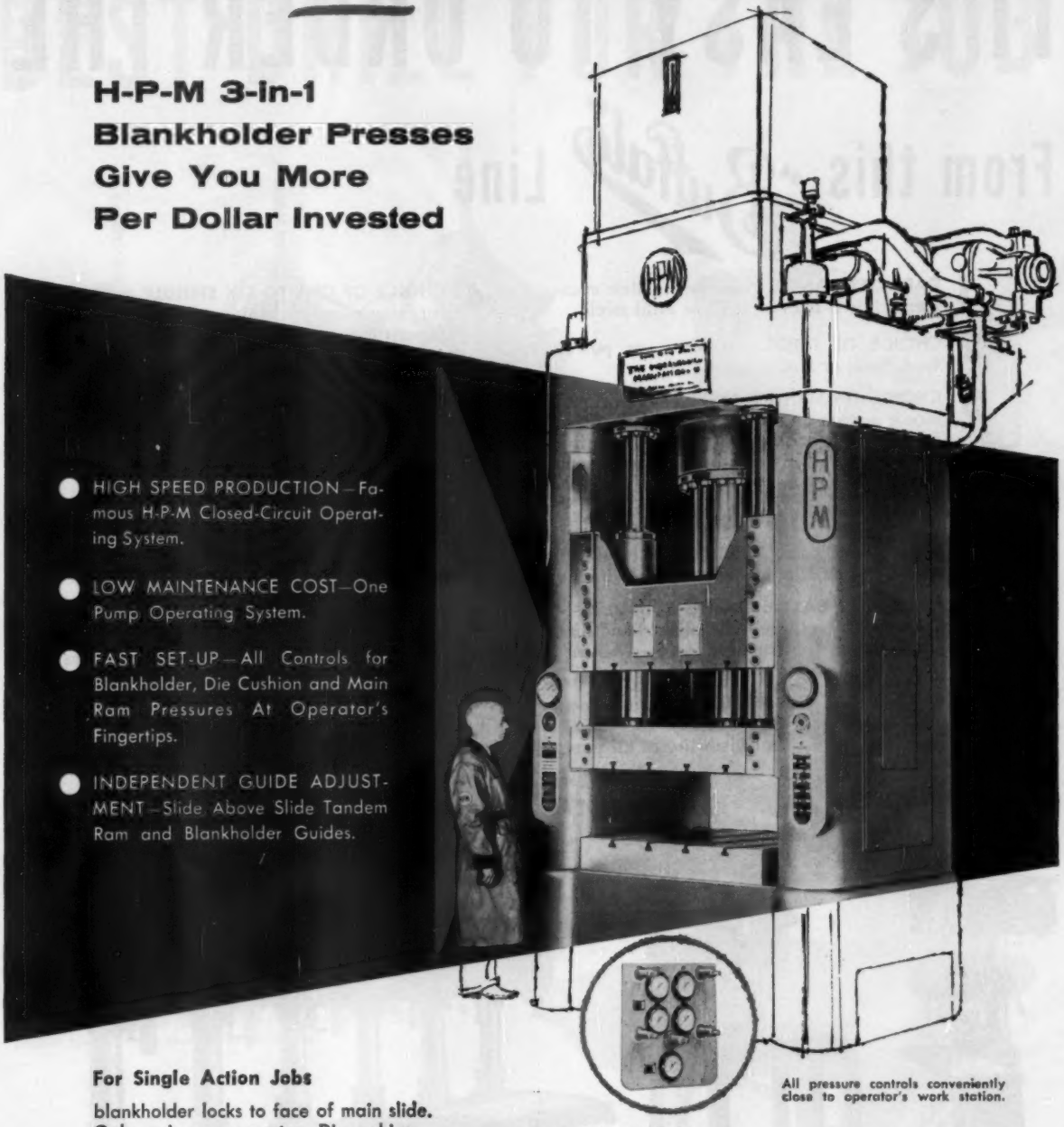
No, Ed would not be wasting time by attending the course; he would be making the best possible use of it. To the alert foreman a knowledge of costs is a constant reminder of the necessity for keeping on his toes. There is also much in it for the oldtimer who, in his youth, got no opportunity to learn about costs from people in a position to teach the subject. In the oldtimer's youth, such information was "under the counter," a jealously guarded secret which no foreman need know. Costs were

"My people want to know what HELLER TOOL is going to announce on Feb. 1!"

"I notice you guys aren't laughing like you were when I put the idea in the suggestion box."

here's why H-P-Ms PAY OFF

H-P-M 3-in-1 Blankholder Presses Give You More Per Dollar Invested



- HIGH SPEED PRODUCTION—Famous H-P-M Closed-Circuit Operating System.
- LOW MAINTENANCE COST—One Pump Operating System.
- FAST SET-UP—All Controls for Blankholder, Die Cushion and Main Ram Pressures At Operator's Fingertips.
- INDEPENDENT GUIDE ADJUSTMENT—Slide Above Slide Tandem Ram and Blankholder Guides.

All pressure controls conveniently close to operator's work station.

For Single Action Jobs

blankholder locks to face of main slide. Only main ram operates. Die cushion is idle.

For Deep Drawing Jobs

blankholder is locked to face of main slide. Main ram and die cushion operate. Die cushion used as lift-out with delayed action on return stroke.

For Deep Drawing Jobs

main ram, blankholder and die cushion operating. The latter serves as lift-out with delayed action on return stroke.

And, With H-P-M

pressure resistance of each blankholder ram can be individually adjusted—invaluable when drawing parts of irregular contours where blank must be held more firmly at certain points than others.

For complete information, write for Bulletin 5600.

HPM

THE HYDRAULIC PRESS MFG. CO.

Mount, Gilead, Ohio, U.S.A.

A DIVISION OF KOEHRING COMPANY

IT'S EASY TO ORDER THE

From this "Buffalo" Line

1. **CAPACITY RANGE** from the smallest commercial drill sizes to 1½" in mild steel.
2. **CHOICE OF FEEDS** — sensitive or power feed, hand or foot controls.
3. **CHOICE OF SPINDLE SPEEDS** — optional motor speeds and adjustable V-belt drive for the right drilling, tapping or reaming speed; or variable speed drive in the famous "RPMster".
4. **CHOICE OF ONE TO SIX SPINDLE MODELS** for single or multiple operations in all capacities.
5. **ACCESSORIES** — such as slow-speed, tapping and mortising attachments, work lights, vise tables and coolant systems.
6. **ARRANGEMENTS** — horizontal duplex, radial, inverted head and many others to make more jobs easier.

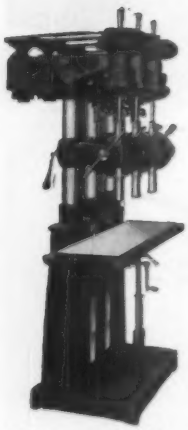
BUILT-IN ACCURACY, CONVENIENCE, LONG LIFE

For 79 years, "Buffalo" has been building exclusively industrial drills with the best and most practical features, which we call the "Q" Factor*:

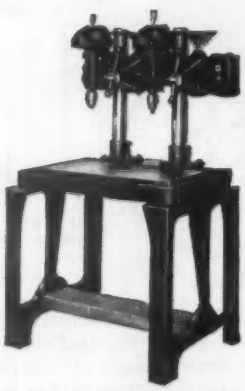
1. **PRECISION BALL BEARING SPINDLES** — high grade steel, ground, polished and dial gauge tested for trueness; take-up adjustment of ball bearings for wear.
2. **CONVENIENT CONTROLS**, table and head adjustment cranks for quickest and easiest handling — excellent visibility of all parts and work.
3. **STRONG, RIGID CONSTRUCTION**, including oversize columns, spindles, bases and true work tables. In pedestal models, ways are hand scraped.

Write us about your drilling problem — we'll mail you Bulletins and recommendations.

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*



⅞" No. 16 Drill



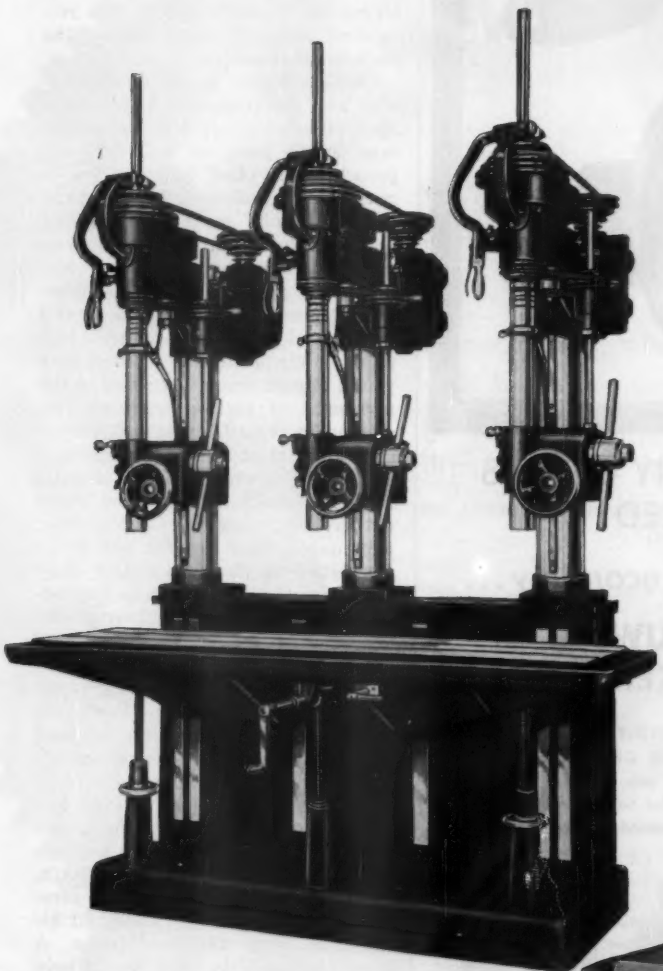
½" No. 15 2-spindle drill

"Buffalo" No. 18 Drill in 6-spindle Bench Model—1" capacity

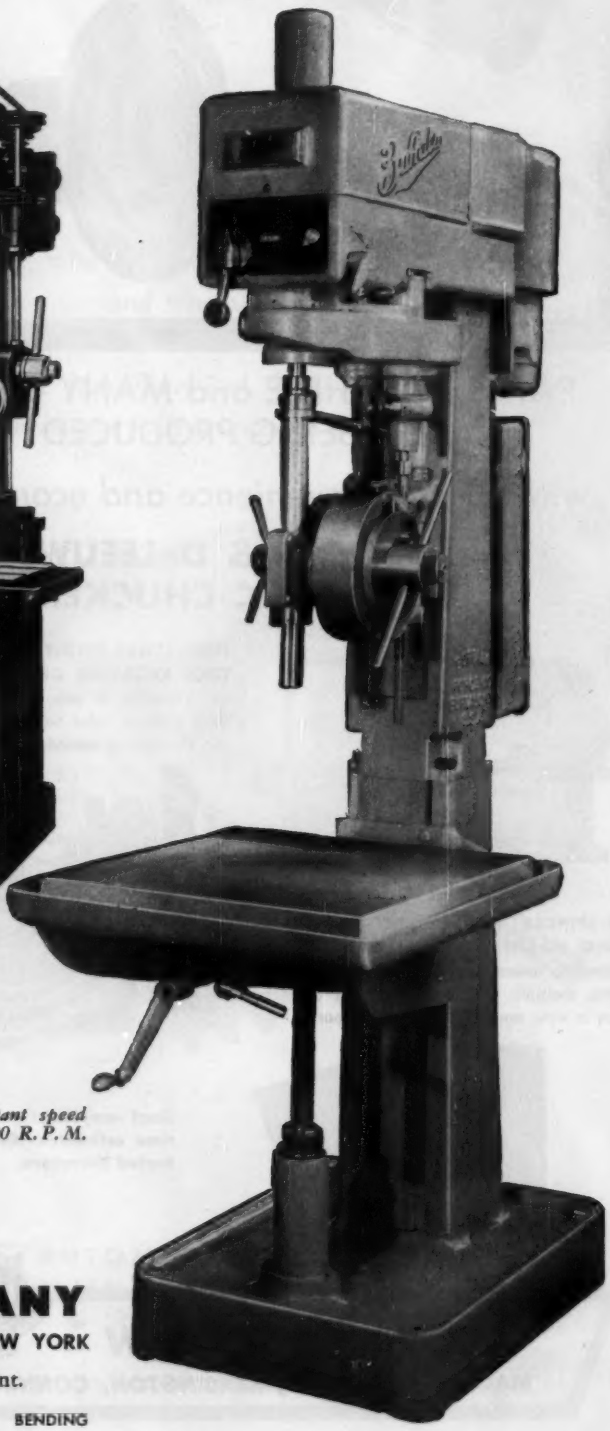
ESTABLISHED 1877 "Buffalo" MEMBER N.M.T.B.A.

DRILLING PUNCHING SHEARING BENDING

BEST DRILL FOR THE JOB



"Buffalo" 3-spindle No. 22 Round Column Drill — power feed, 1½" capacity in mild steel.



The "RPMster" — instant speed control from 100 to 3000 R. P. M.

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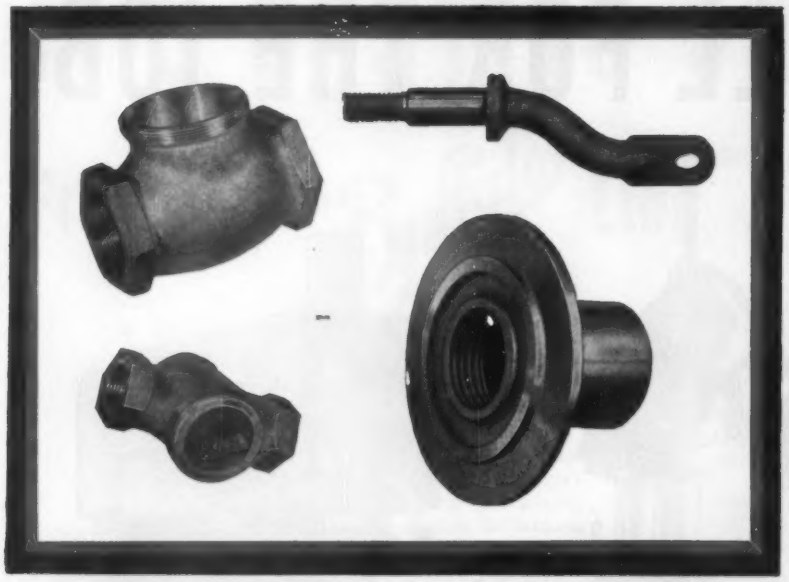
DRILLING PUNCHING SHEARING BENDING



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with speed, convenience and economy...

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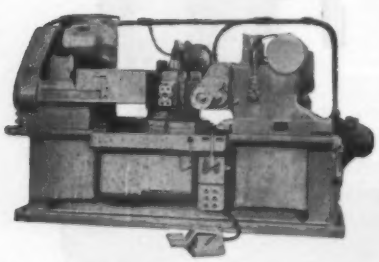
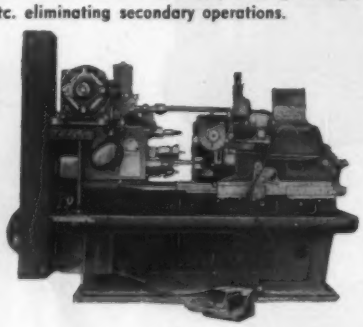


THE "ONE-TWO-THREE" 7-SPINDLE TOOL ROTATING CHUCKING MACHINE can complete in one operation as many as three ends of valve bodies, plumbing fittings, etc. eliminating secondary operations.



4-SPINDLE TOOL ROTATING CHUCKING MACHINES, available in three sizes, combine various turning, boring, facing, threading, multiple drilling and tapping operations on a wide range of single-ended part.

Send samples of your work for time estimates. Ask for illustrated literature.

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GOSS & DeLEEUW QUALITY PRODUCT-QUANTITY

never mentioned to a foreman if his were low. He heard more than enough about them if they were high, but was never told of how they were arrived at. In point of fact, in those bad old days, costs were used to hamstring the foreman and it was recognized policy to keep him in the dark on that subject.

On completion of my apprenticeship as a draughtsman, I thought a spell on costing might be an advantage to me later on and duly approached the chief with a view to realizing my ambition. The company was a family concern employing about two hundred hands engaged on general production. The owner and his three sons filled all the managerial positions and the one that I had to deal with got on his hind legs immediately at the mere idea of a young draughtsman interested in the mysteries of cost accountancy. He seemed to regard my application as something of an offence and made it abundantly clear that my unusual request would not be granted. Present-day employees are more favored and, unless they are too old to be interested in new adventure, they will be well advised to take full advantage of every offer likely to increase their bargaining power and their pull with the higher-ups.

Foremen who are nearing sixty are not likely to be much interested and perhaps it would be a mistake to insist on their participation, although in some large plants here in Britain there are no exceptions. For all the staff, new courses and works visits are a must, whatever the age.

In general production, difficult, awkward jobs which tax the foreman's ingenuity tend to distract his attention from the cost factor. A course of study in costs would help to keep his mind focused on the sub-

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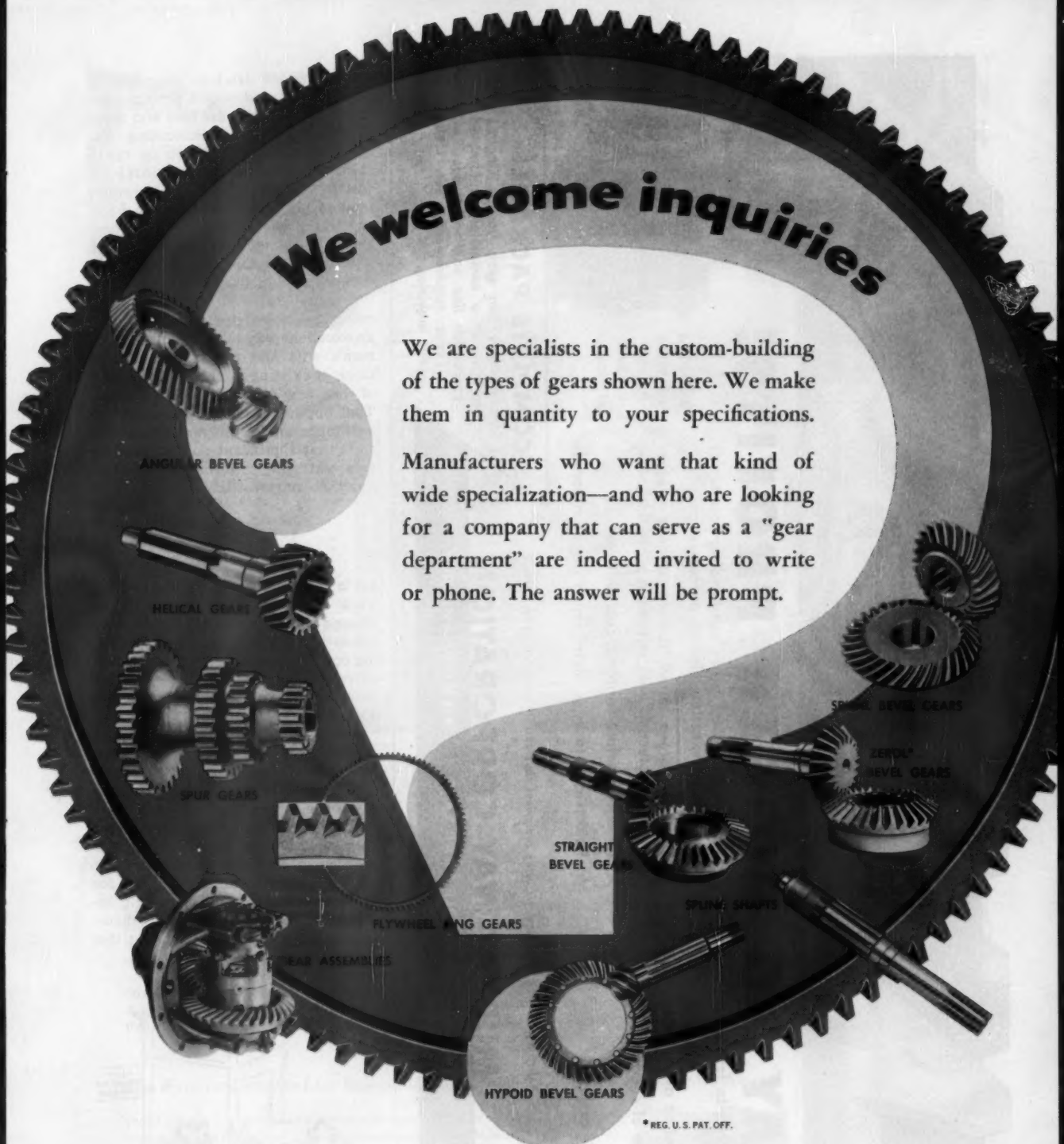
We are specialists in the custom-building of the types of gears shown here. We make them in quantity to your specifications.

Manufacturers who want that kind of wide specialization—and who are looking for a company that can serve as a "gear department" are indeed invited to write or phone. The answer will be prompt.



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THE WAY TO BIGGER PROFITS!

★ Pre-polishes greater area in less time than any contour polishing.

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ject. It would tend to give him a new outlook and would prompt him to plan in advance the best and most economical ways of executing the not-so-straightforward job or operation. Without some knowledge of costs, even good, youngish foremen tend to pat themselves on the back on licking the difficult job, without giving a thought to the cost, or if alternative methods would not be cheaper and just as effective.

A study course on costs, backed by refreshers throughout the year, is an excellent way to sharpen the foreman's wits and to make him take stock of existing methods in the light of his newly acquired knowledge. That applies to all but the oldest of oldtimers, and employers should see to it that significant cuts in production costs, due to foreman initiative, don't go unrewarded.

C Donald
Lanarkshire, Scotland

ED is taking a very narrow-minded view of the training course being offered by the company. His attitude toward this course is not a surprising or an unusual one; it is representative of the feeling most old-line shop men have toward any attempt to realign their thinking.

When people do something in a certain way for a long time they convince themselves that their way is the best. A person may be doing a job the wrong way but they have been doing it that way so long that they have become expert at it. Each performance of this particular task does not serve as an opportunity for them to discover their error but, instead, makes them surer of themselves and more convinced that this

"Wow, that must've been some pep-talk!"

KLING COMBINATION
SHEAR, PUNCH AND COPER

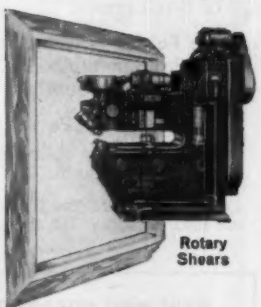
One machine does ALL These Jobs and MORE!

Its Magic Performance Can Win You Many "Production Oscars"

This "jack-of-all-jobs" will do the work of a half dozen machines, yet it does not take up any more floor space and represents very little more investment, than a shear or punch, or any other single-purpose machine.

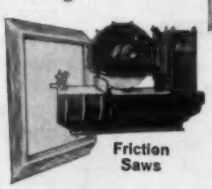
Here is another production-boosting and cost-cutting feature: with this versatile machine two men, working on each side of the machine, can turn out the same or totally different jobs, at the same time! Enables you to double output, using your present staff.

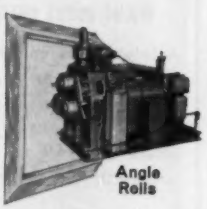
Available in 3 sizes for light, medium or heavy work. Kling Combination Shear, Punch & Copers are speeding production and cutting costs "in the best of companies." Write us for names of some of these firms in your industry —and also for a copy of the New Kling Combination Bulletin No. 347-A.


Rotary Shears

Also Write for Complete Line Bulletin 100, Showing KLING Metal Working Machines

This bulletin is practically a miniature catalog—fully illustrates and describes these machines and all the others in the complete Kling line of Metal Working Machines. Send for it today.


Friction Saws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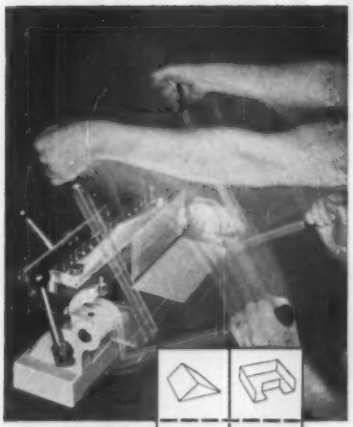

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A number of forming jobs can be done with the Di-Acro Box Finger Brake, by simply adjusting or changing the type of mounting bar on the contact surface. Di-Acro Finger Brake is:

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di-acro PRECISION METALWORKING MACHINES

is the only way. This situation is well illustrated by the man who was asked if he ever used a certain tool. He replied that he had never heard of that tool but he was sure that the one he used was better.

Customs and habits are valuable because they permit performance of routine jobs without lengthy consideration each time they are performed. In some respects they are a problem and a drawback. Once firmly established they are hard to destroy. They continue long after any reason for their being exists, long after the reason for their origin has been forgotten. So it is with Ed's determination to stick to his old methods.

Having the foreman attend a two weeks' training course entails a great deal of expense on the part of management. They have planned this course and are spending this money because their experience in this matter and the available evidence indicates the value and merit of such a move. The foreman should accept the decision of the company in the same spirit in which it was made. He does not have any evidence to indicate that the course will not be of value to him in his work.

If he enters the course convinced that it is valueless, there is very little chance that he will get much benefit from it.

Ernest Jones
Bronx, NY

QUICK STUDY . . . OR TRY-AND-SUCCEED?

Is a foreman the best judge in sizing up and placing a job applicant in his own department? Or is Personnel better equipped to gage the abilities and experience of the worker?

IF A FOREMAN had the time to properly devote to a new man he certainly could detect the essential qualities in him and, as is often possible, uncover a "fast worker" who usually tries and often succeeds in bluffing his way along to the point where he acquires sufficient experience at the employer's expense to unfurl the sails of his own progress.

The foreman's specialty is dual in nature: knowing thoroughly the work to be done in his department, and having the qualifications to get the best out of his men. Assuming that he has a staff of first-class workers under him, and is well up on human psychology, his chances of smooth sailing are high, and life for him should be one round of bliss from starting bell to quitting time. Unfortunately he is constantly presented with new men who come to him in every shade of qualification and makeup.

The new employee is always of X value until the foreman has had him in charge for sometime, and has had an opportunity to observe him at work. Usually he can form a pretty good idea of the man's experience by having him give an account of the places where he used to work and the nature of the jobs he did while there.

One oldtimer of my acquaintance, a rough-and-ready machine shop foreman, made up his own questionnaire which he usually had the unknown fill out first before he wasted a minute in interviewing him. Upon its completion he let the applicant sweat it out for a time before taking a look at it. He'd give it the once-over and then, if satisfied, he'd carry on from there until the man was hired or told that he would be kept in mind. He discarded this questionnaire stunt after finding out that the man who flunked his special quiz turned out to be as good or better than any of his older men. Ordinarily he would have sent the man on his way without any more time spent on him, but the fellow wouldn't take no for an answer and insisted that he be given a trial. The foreman was desperately in need of a man, and took a chance. When

"The wages are high, the hours short and the working conditions are just short enough of being ideal to give you plenty to gripe about."

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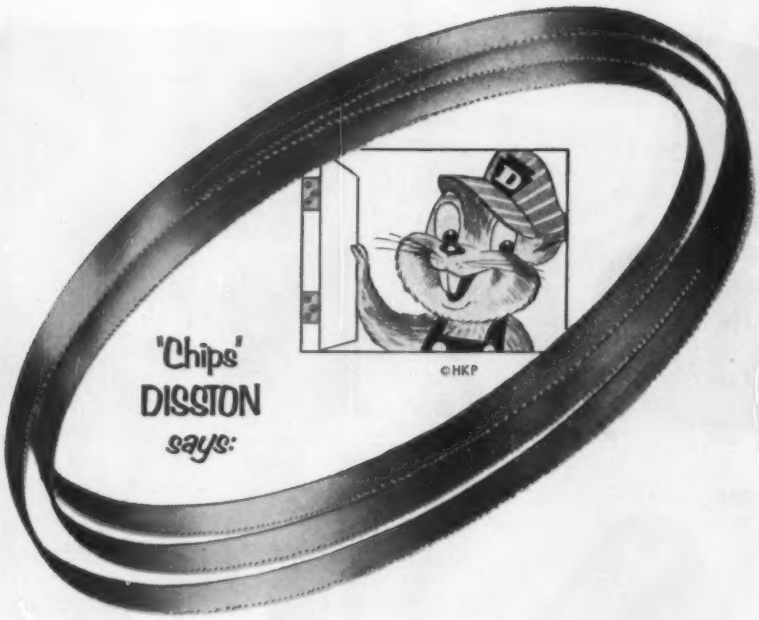

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Does your work call for close tolerance cutting . . . fine edge-holding qualities . . . good finish? Disston Metal Cutting Band Saws give you all that and more —*long, long blade life!*

LANCER TOOTH—Hard edge blade with positive rake angle tooth. Permits high-speed production cutting of non-ferrous metal, wood and plastic. Cuts brass and aluminum solids and Plexiglas with equal ease.

REGULAR TOOTH—Hard edge flexible back band saw with finer tooth spacing. Cuts all ferrous metals and thinner sections of non-ferrous metal and plastic. Excellent for sawing angle iron, steel tubing, nickel plate and brass sheets.

Your Disston distributor is the man to see if production is too low and costs too high. He can help you boost one and lower the other.

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To obtain YOUR FREE COPY of Disston's colorful, information-packed booklet on Metal Cutting Band Saws, write today to Dept. 20, Henry Disston Division, H. K. Porter Company, Inc., Philadelphia 35, Pa.

HKP Henry DISSTON DIVISION
H. K. PORTER COMPANY, INC.

asked why he made such a rotten showing on the quiz he said that he never gave a rap for such paper things. "It's what I do that counts, not what I say." Here was a man who wouldn't get to first base were it left to the office to decide his fitness.

Another chap of my acquaintance was a one-eyed floor hand who was a master craftsman on overhauling large pneumatic equipment used around a structural steel fabricating plant. This bird came awake with liquor on his breath and had it throughout the ten-hour day because of "snack-time" applications furtively taken from a small flask. These were old Bill's alcoholic coffee breaks in the days when a coffee break was an industrial unknown. Fortunately the foreman was an imbiber himself, outside of working hours, or Bill wouldn't have stood a ghost of a chance to get in through modernistic channels of hiring as we know them today.

Wally Hunter
Ambridge, Penna

Names in the News . . .

S S Inch has been named vice president and director of sales of Kaiser Aluminum & Chemical Corp. He was formerly vice president of Kaiser Aluminum & Chemical Sales, Inc, the corporation's sales subsidiary. **John E Menz,** general sales manager of the sales company, succeeds Mr Inch.

Arthur V Loughren, vice president in charge of research for Hazeltine Corp, has joined Airborne Instruments Laboratory, Mineola, NY, as vice president of its new Research Division.

John E Wilson has been appointed to the new post of general superintendent, manufacturing, Marchant Calculators, Inc, Oakland, Calif. He moves up from the post of superintendent of the parts production plant.

Earl B Smith has been promoted from assistant manager to sales manager of Osborn Manufacturing Co's Machine Division. **Edmond K Hatch,** assistant chief engineer, succeeds Mr Smith. **E Henry Brauer,** who takes over Mr Hatch's post, will be in charge of both the molding machine and brush machine engineering sections.

Frank J Gleason, executive vice president of Copeland Refrigeration Corp, has been named president. He succeeds **Harry E Thompson,** who has resigned.

Anthony Maladra, assistant sales manager of K S M Products, Inc, has been named sales manager of the Stud Welding Division, Merchantville, NJ.

Eduard Baruch, president of Heli-Coil Corp, subsidiary of Topp Industries, Inc, Los Angeles, has been elected vice president and director of Topp.

B R Teree has been appointed chief engineer of Greer Hydraulics, Inc, Jamaica, NY.

A S Glossbrenner, vice president, operations, of Youngstown Sheet & Tube Co, has been elected president of the company to succeed **J L Mauthe,** named board chairman. **Walter E Watson,** first vice president, has been elected vice chairman of the board. Additional appointments: **William H Yeckley,** manager of steel operations, to vice president, operations; and **Frederick M Mayer,** president of Continental Supply Co, a company division, to vice president.

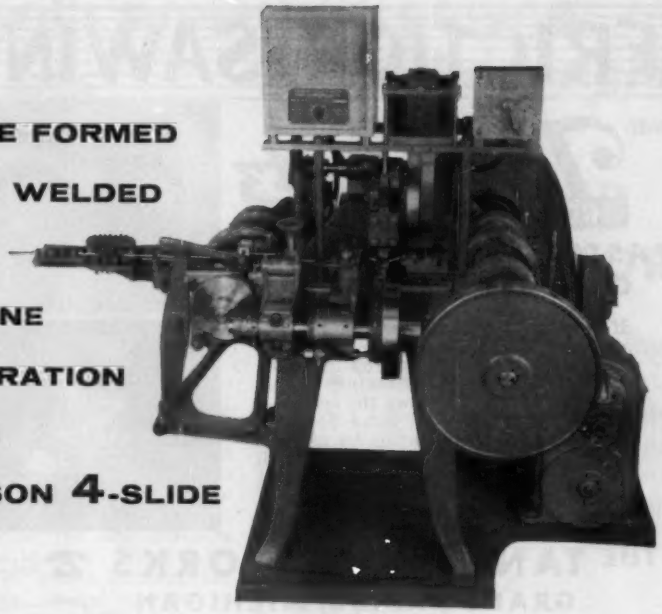
B F Gira, president of Topp Industries, Inc, Los Angeles, has been named a vice president of Heli-Coil Corp, Danbury, Conn, subsidiary. **Leo J Brancato,** H-C director of engineering, has also been named to a vice presidency. **John Rabuse,** sales manager in charge of the original equipment market for H-C, has been appointed assistant to the president.

John H Dolan has been appointed general manager of Chicago operations for Lamson & Sessions Co. He has been western district sales manager since 1948.

Alfred L Stoops has been appointed press sales engineer for the Hamilton Division of Baldwin-Lima-Hamilton Corp. Headquartered in Cleveland, he will handle sales of Hamilton mechanical and Baldwin hydraulic presses in northeastern Ohio, western Pennsylvania, and West Virginia.

Boyd Draper has been named superintendent of production at Temco Aircraft Corp's Garland, Texas, plant. He was previously general foreman of the Lockheed C-130 program. **E F Janesic,** senior contracts

WIRE FORMED AND WELDED IN ONE OPERATION WITH NILSON 4-SLIDE



Garter loop formed and welded in one fast operation by Nilson 4-Slide.

Production is increased more than 25% by Hawie Manufacturing Company using a #1 Nilson 4-Slide with welding attachment which eliminates need for ferrule loops in the manufacture of hose supporters. .062 soft basic wire is formed with ends welded in one automatic operation at a conservative 105 pieces per minute. Additional savings are realized in eliminating cost of ferrule.

Another example — Drapery hook is formed with two wires entering 4-Slide simultaneously and automatically welded together at point of contact.

Nilson 4-Slides will produce many types of wire forms similar to the part shown here in which two pieces must be welded or otherwise closed together. By the mounting of automatic welding equipment on the 4-Slide, such parts can be produced in one fast, accurate operation at minimum cost. Nilson 4-Slide Wire Forming Machines are available in a wide range of sizes to handle basic steel wire from 1/32" to 1/2" diameter.

A.H. NILSON MACHINE COMPANY

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Automatic Chain Making Machines • Staple Forming Machines • Wire and Stock Reels • Wire Straightening Equipment • Slide Feeds for Presses • Wire and Ribbon Stock Forming Machines

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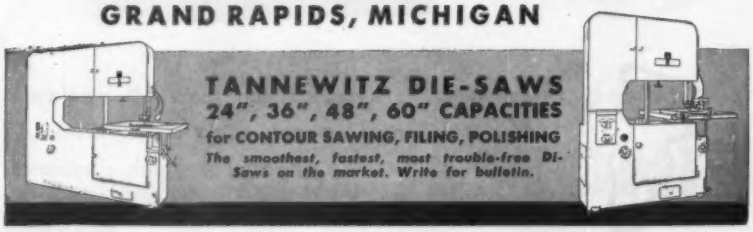
HIGH SPEED BAND SAWS

FASTEST, BEST MEANS OF CUTTING METALS

If you are not familiar with the advantages of friction sawing with these machines, by all means drop us a line asking for "Friction Sawing Data." You can save many times the cost of a Tannewitz High Speed Band Saw and greatly expedite production by using it to cut sheets of both hard and soft steel, formed or flat, trimming malleable and steel castings, cutting armor plate or many other materials. Write NOW!

THE TANNEWITZ WORKS ☎ GL-6-1729
GRAND RAPIDS, MICHIGAN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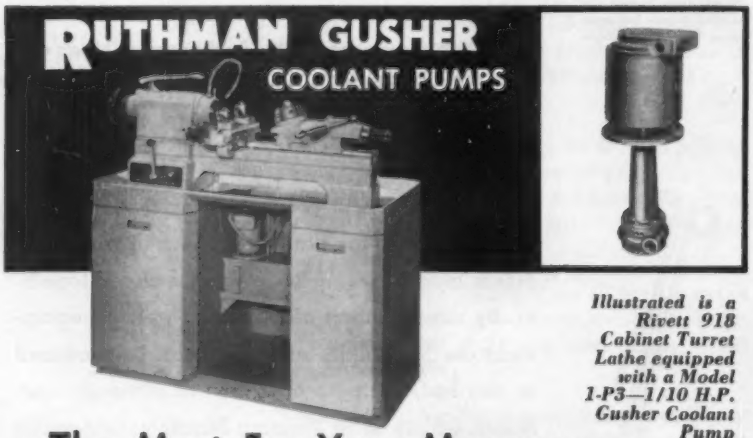
for CONTOUR SAWING, FILING, POLISHING
The smoothest, fastest, most trouble-free Di-Saws on the market. Write for bulletin.

RUTHMAN GUSHER
COOLANT PUMPS



Illustrated is a Rivett 918 Cabinet Turret Lathe equipped with a Model 1-P3—1/10 H.P. Gusher Coolant Pump

The Most For Your Money

Moderate in initial cost, Gusher Coolant Pumps are pre-lubricated . . . require no packing . . . are electronically balanced . . . have no metal-to-metal contact within the impeller housing. Vibration and wear are cut to an absolute minimum. You are sure of a long trouble-free life. To save *your money* always specify Ruthman Gusher Coolant Pumps. Write for our new catalog.

THE RUTHMAN MACHINERY CO.
1818 Reading Road Cincinnati, Ohio

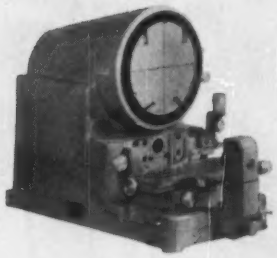
administrator at the Dallas plant, has been named manager of manufacturing control.

Lewis A Greene has been appointed factory manager of Aero-Coupling Corp, Burbank, Calif, subsidiary of Aeroquip Corp. Prior to the appointment he was purchasing agent at Aeroquip, Inc, Van Wert, Ohio, subsidiary.

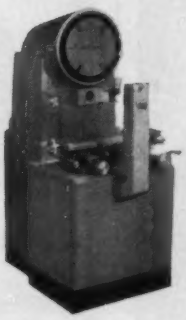
T S Pacer (top), **E B Smiley** (center), and **G P Sullivan** have been elected vice presidents of Illinois Gear & Machine Co. Each of the men has served with the company for more than 20 years in various executive capacities

Speed production with projection gaging

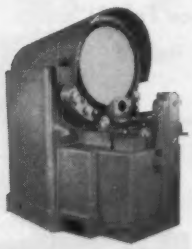
. . . and the *right* KODAK CONTOUR PROJECTOR



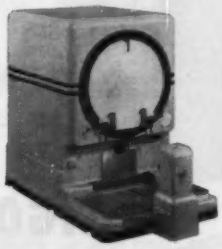
Model 14-2A—Do you need a versatile precision measuring instrument for toolroom or production lines? Kodak Model 14-2A measures intricate parts to the order of .0001″, lets you do routine gaging by comparing the part with a chart. Measuring attachment is equipped with micrometer guaranteed accurate to .00005″ over the entire 1″ range. Dial indicator ends need for micrometer feel. Kodak Measuring Blocks, in standard dimensions, can be inserted in the horizontal and vertical micrometers to cover full travel range. Has 14-inch screen. *You can use any Kodak Contour Projector anywhere in normal light.*



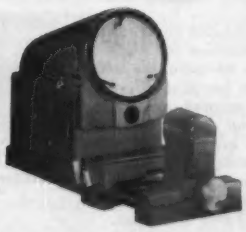
Model 14-5—Are the parts you have to inspect heavy? Model 14-5, optically the same as Model 14-2A, comes with an extra-large, heavy-duty worktable; its box-like construction withstands great weight without measurable deviation. Model 14-5 has the same measuring range as the Model 30, with 8 inches of table travel in both horizontal and vertical planes. *Optical inspection requires little training, and Kodak Contour Projectors are designed with the operator's convenience in mind.*



Model 30—A heavy-duty worktable plus a 30-inch screen makes this the model for toolroom or production inspection of large parts. Table traverse is 8″ in both horizontal and vertical planes, focusing travel totals 3″. Engraved dial, calibrated to 2′ of arc, permits angular measurement reading directly, without need of vernier. *The versatility of optical inspection and the adaptability of Kodak Contour Projectors let you do many measurement tasks with one unit.*



Model 3—Check long runs quickly and accurately with this low-cost instrument. Designed for use with your own staging fixtures, Model 3 comes with flat stationary table. Adjustable chart holder permits "set lines" on ground-glass overlay chart to be brought to coincidence with "set surfaces" of the fixture, avoiding need for table movement. *Seemingly impossible-to-measure shoulders, holes, angles, and relationships are easily gaged on Kodak Contour Projectors.*



Model 8—Inspect horizontally and vertically, anywhere in your plant with Model 8. Take this cast-aluminum unit wherever there's need for fast, accurate inspection of small parts. For horizontal inspection, simply stage the part in a simple holding fixture. For vertical measuring, turn Model 8 on end and stage the part on a flat glass stage. Part image on the 8-inch screen is erect and unreversed both ways. Six magnifications from 10× to 100×. *Kodak Contour Projectors have rugged housings to more than withstand conditions of normal use.*

Eliminate receiving inspection bottlenecks, avoid waste on reject parts, predict tool failure before it occurs, speed inspection to match production, make final measurements. Which of these Kodak Contour Projectors will solve your production problem?

How to learn more about Kodak Contour Projectors

From the Kodak Ektar Lens system, (heart of Kodak Contour Projectors), to the precision machining of critical parts, these units are built to meet your most rigid requirements.

To the basic Projector, you can add a number of optional staging and measuring attachments. Your Kodak Representative will be glad to describe these to you and explain their uses.

For the name of our representative or for a descriptive catalog on Kodak Contour Projectors, write to Special Products Sales Division, Eastman Kodak Company, Rochester 4, N. Y.

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the **KODAK CONTOUR PROJECTOR**

Kodak
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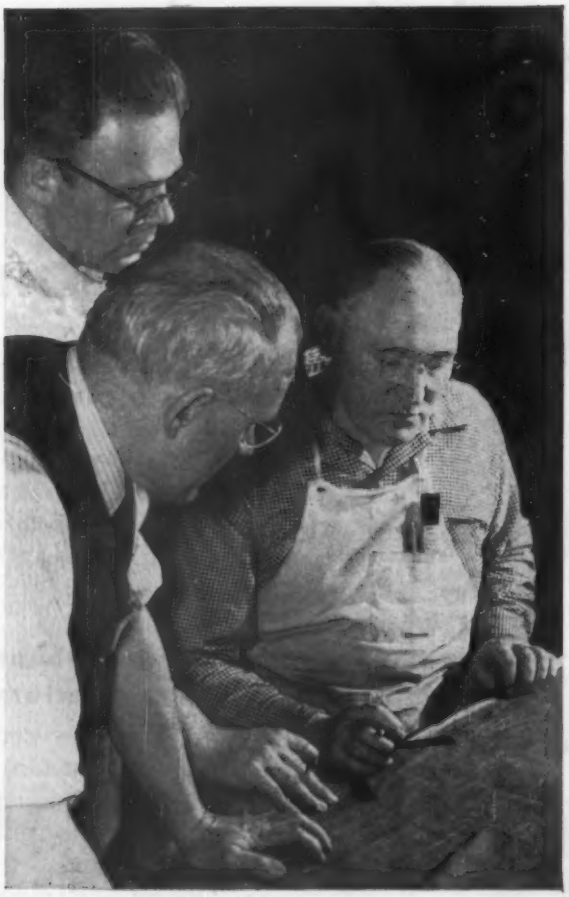

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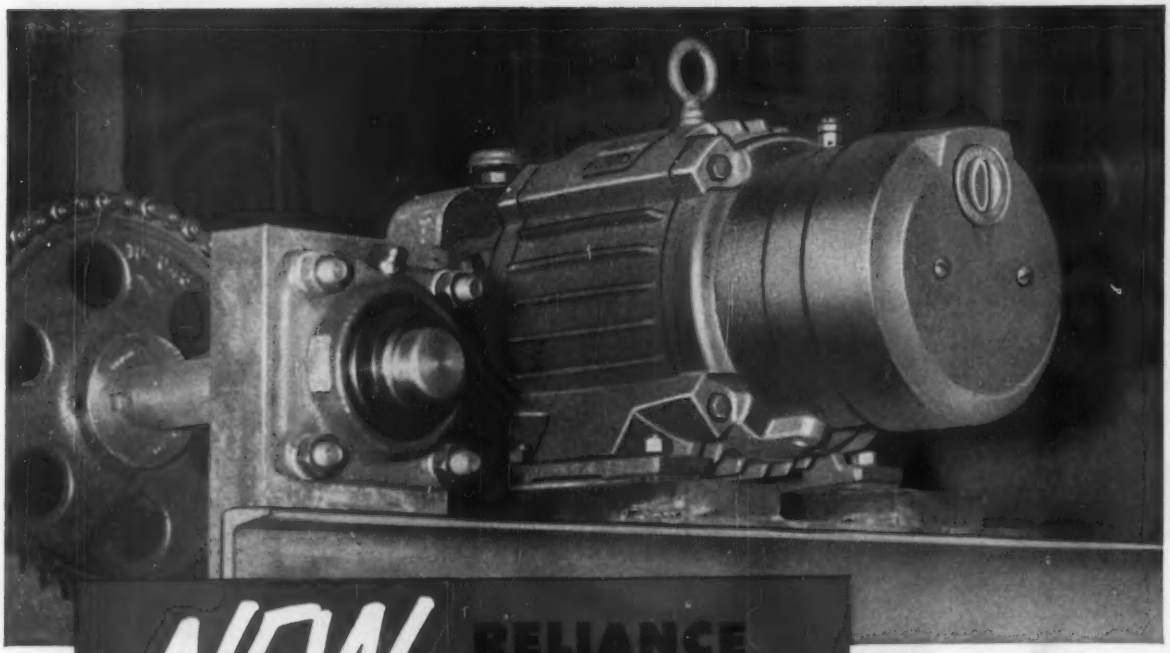

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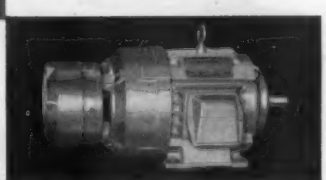
Simple brake has only six parts and requires no control wiring or auxiliary electrical equipment. Compact construction requires a minimum of space. Wearing parts are easily accessible for fast maintenance.

For further information write for bulletin B-2503. B-2503



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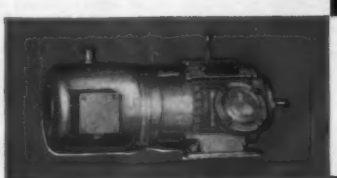
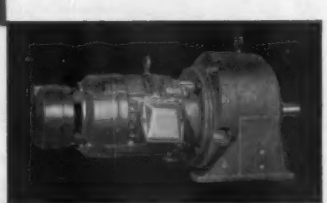
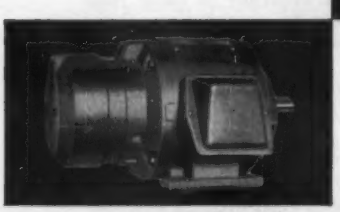


Explosion-Proof—Cl. I, Gr. D and Cl. II, Grs. E, F & G



Corrosion-Proof Gearmotor



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Financial Aid to Higher Education

A Fine Start, But...

This editorial has two purposes. The first is to salute American business for the fine start it has made in helping to relieve the financial plight of our colleges and universities. The second purpose is to stress the importance of having business provide more financial aid, and soon.

How Business Helps Higher Education

Business contributions to higher education doubled between 1950 and 1955. They jumped from $40 million to $80 million. Preliminary figures indicate they will be even higher this year.

Business firms have also shown a lot of ingenuity in devising different ways of making their contributions. The methods range from a matching of an employee's contribution to his particular alma mater to wide diffusion of the money through state and regional money-raising associations of colleges and universities. Thanks to this ingenuity, business firms now have a wide choice of ways by which to give effective aid. The way most appreciated by college administrators is the making of gifts unrestricted as to the purpose for which the money is used.

Imposing as it is, however, what business has done thus far is only a good start. Only a tiny fraction of the total number of business firms in the country are giving direct financial help to our colleges and universities; and this fraction includes fewer than half of the hundred largest corporations in the country. Also, the amount of financial help being provided by business constitutes only a very small fraction of what is needed.

Why Colleges Need More Aid

Right now our privately endowed colleges and universities need about $350 million more in operating income a year than they are receiving to enable them to pay decent faculty salaries and be in tolerably good working order otherwise. The reasons, including a severe decline in the purchasing power of their endowment income because of price inflation, have been dealt with in the previous editorials in this series.

In addition, these institutions, together with the tax-supported schools, are faced with a tremendous increase in enrollment over the years ahead. With both a rapidly increasing population of young people and an increasing propor-

tion of them going to college, this year's enrollment of 3.2 million students is expected to reach 4.0 million by 1960, and to be doubled by 1970.

For the next ten years our privately supported colleges and universities must have an average of about $400 million a year above what they can be expected to collect from tuition fees, income from endowment funds, etc.

This figure of $400 million does not include what is needed for new buildings and equipment. It also does not include help for tax-supported schools above what they get from taxes, fees, etc. Business has given and will continue to give these schools substantial aid. Indeed, almost 25% of the financial help from business for our colleges and universities went to tax-supported schools in 1955.

If aid from business met their needs for increased operating income, the privately supported colleges and universities would be given a decisive lift in performing successfully their part in our system of higher education. They would still have large needs of capital equipment — buildings, dormitories, laboratories — but help from other sources, such as that provided by devoted alumni, where they are well organized, could be expected to go far toward meeting these needs. Also some companies prefer to concentrate on meeting needs of this type.

What 1% of Profits Would Do

But do business firms have the capacity to fill the gap in adequate operating income for our privately endowed colleges and universities without putting an excessive financial burden on themselves? Those who have studied this capacity carefully say that the answer clearly is yes. If, of its profits before taxes — this year an estimated $43 billion — business were to devote 1% to helping our privately endowed colleges, it would take care of present operating needs of about $350 million a year. And the balance of $80 million would be a big step in meeting their needs for new buildings and equipment, too.

About one half of a 1% contribution of this sort would, in effect, be made by the federal government. Up to a limit of 5%, contributions of this type are exempt from the federal corporate income tax. For corporations with incomes above $25,000 per year this tax is 52%.

It is clear that not all business firms are in shape to devote 1% of their profits to aid to higher education. Even in this year of record-breaking prosperity, many of them will have no profits at all. But if business generally would take 1% of pre-tax profits as a target or benchmark for financial help to our privately endowed colleges and universities these institutions would again have sturdy financial foundations.

Relatively this is a very small price to pay (1) to insure a continuing supply of competently trained young men and women and (2) to buttress our freedom by assuring the successful survival of the privately supported sector of our system of higher education.

This is one of a series of editorials prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments of particular concern to the business and professional community served by our industrial and technical publications.

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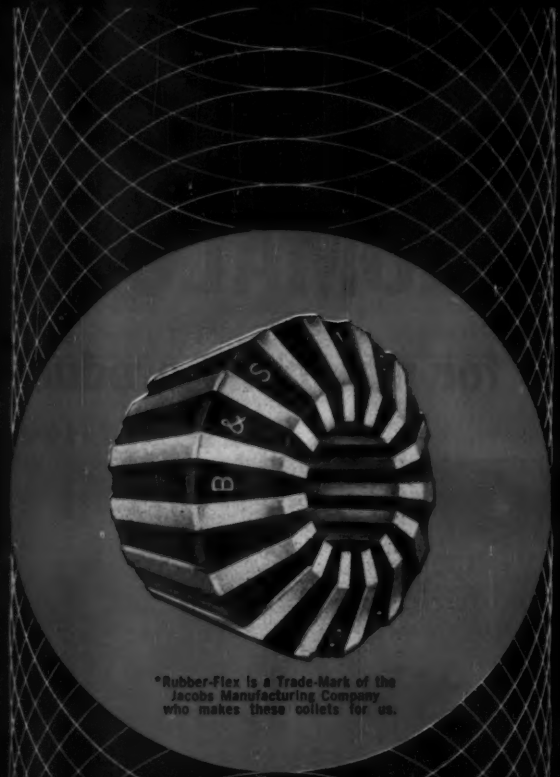

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The unique concentricity of Rubber-Flex Collets assures highest accuracy on the finest work. Run-out at the spindle nose is far less than with conventional equipment. What's more, collet faces seal flush against the chuck nut . . . protect the spindle unit from chip-laden coolant.

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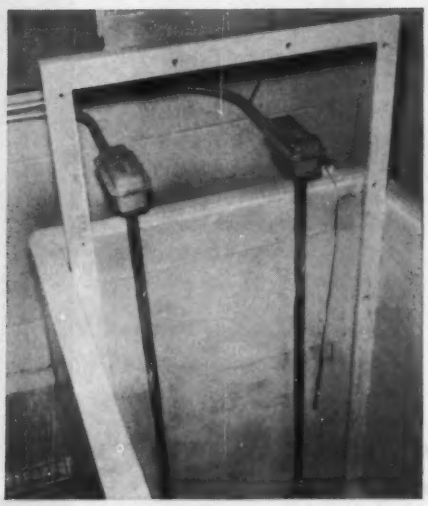
CHROMALOX Electric Heat

for maximum production line efficiency

This single control panel helps maintain maximum efficiency of work flow and processing. From it, conveyors, tanks, and oven heaters are controlled.



Stripping off old paint, cleaning, rinsing and pickling are done in sequence in five tanks, heated by thermostatically controlled Chromalox Immersion Heaters.

From stripping paint off old signs to baking the new finish, signs are turned out with minimum delay at the new sign plant of the City of Detroit.

Paint stripping, cleaning and rinsing, pickling and rinsing are the first operations, taking place in five tanks, side-by-side. Chromalox Immersion Heaters in each tank were built with sheath material adapted to the solution. Inconel was used for the caustic stripping solution, Stainless Steel for the pickling tank, and Copper for rinse water.

After background paint is sprayed on, the signs are baked in a 90kw oven, heated by 36 Chromalox Radiant Heaters in vertical banks staggered from side to side. Next, lettering is applied by either silk screening or roll coating on raised letters. Then the signs again pass by conveyor through the oven for a final baking.

This well planned oven features two Chromalox Input Controllers, which adjust individual heater output to varying work sizes, conveyor speeds, different finishes. Heat intensity can be varied at the turn of a dial from 4 to 100 per cent of rated capacity.

If your production line heating is a problem . . . chances are electric heat can do the job better . . . and Chromalox can do it best. We'll be glad to send you helpful information, or better, have a Chromalox Sales Engineer give you personal attention.

A final baking in this electrically heated oven, and signs of all types and sizes are ready for the well-marked streets of Detroit.

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Technical-ities

By John S. Davey

Bolts take greatest stress during wrenching

If a bolt doesn't fail when being wrenched up tight, it won't fail in service (assuming bolts and joint have been designed adequately for the loads).

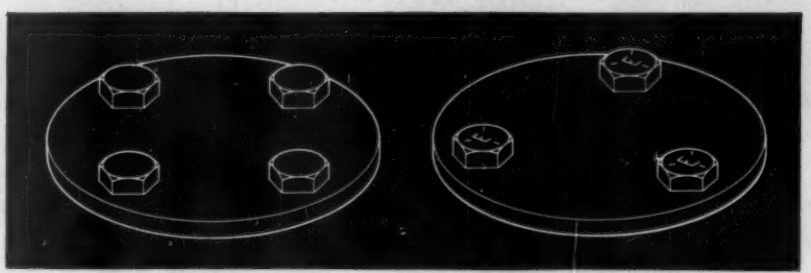
That's because two forces put stress on bolts (and cap screws) as they tighten: Tension due to bolt stretch; torsion due to friction. But only tension remains after wrenching. In a rigid joint, if this tension exceeds external forces, bolts will never experience any further strain, and will therefore not loosen or fail.

WHY SOME FAILURES?

Obviously, unusual unforeseen loads cause trouble. The instant they exceed residual tension, *they add* to the stress placed on the bolt and can cause *immediate* failure. Or they can cause loosening, leading to stress change, which in turn causes fatigue and failure. That's why you've got to torque bolts tight . . . and the tighter the better.

An exception: A flexible joint. With high cyclic loading, again loosening and fatigue cause trouble. Since you shouldn't tighten such a joint too much, sometimes the only remedy is to take out the flexible element and put in a rigid joint. (A metal to metal flange connection instead of a gasketed one, for example.)

Are you using more bolts than needed?



The stability of a 4 bolt arrangement can be matched by a 120° spacing of 3 bolts. Strength can be actually increased by using RB&W high carbon heat treated bolts (identified by "E" and three radial dashes).

NOBODY wants to use too few bolts or cap screws and risk failures. But using too many is not the best answer either. It means too many holes to drill, to fill — both costly.

RB&W offers some suggestions.

BALANCED BOLT PATTERN

By "rule of thumb," bolts are generally arranged symmetrically in a pattern of four. Yet three bolts 120° apart around a common center will prove just as stable, and save on assembly. With stability assured, the problem is then one of load capacity.

PRELOAD TO GET FULL CAPACITY

In checking size and number of bolts, calculate the stress and get rid of the excess. You have enough if you've allowed for usual factor of safety . . . *and the fasteners are tightened so that residual tension exceeds maximum external load anticipated.* If they are, you have safety. The bolts will *stay* tight, won't fatigue, won't fail.

With RB&W standard fasteners, engineers and production men can take quality, uniformity and dependability for granted — and can concentrate on the problem of proper application and assembly. For help or information on your specific product, write Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N.Y.

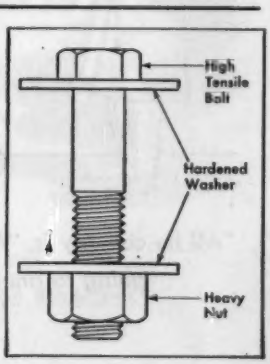
Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

High strength bolts stop joint failure from vibration

Shakeout equipment used by one company for unloading coal cars applied its vibration via a fabricated frame lowered onto the cars. This frame was originally riveted.

But it was a constant source of maintenance. About every 10 days, the frame had to be welded, loosened rivets replaced. Finally it was refastened with RB&W high tensile bolts and hardened washers. Maintenance now is *nil!*

Proving again that high strength bolts make the strongest connection for the severest service.



Northfield KEYSEATER

Model K-6

The New Northfield Model K-6 Keyseater is designed to cut straight or tapered keyways from ⅛" to 1" wide. Work of any shape and diameter can be clamped to the table and cut, grooved, or slotted.

Well engineered design features assure work of exceptional accuracy. Over 30 years of quality machine design and manufacture guarantee satisfaction.

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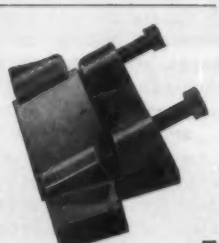

FOR ANY WORK
ON ANY MACHINE TABLE

HART *DIVIDED MACHINE VISE JAWS*

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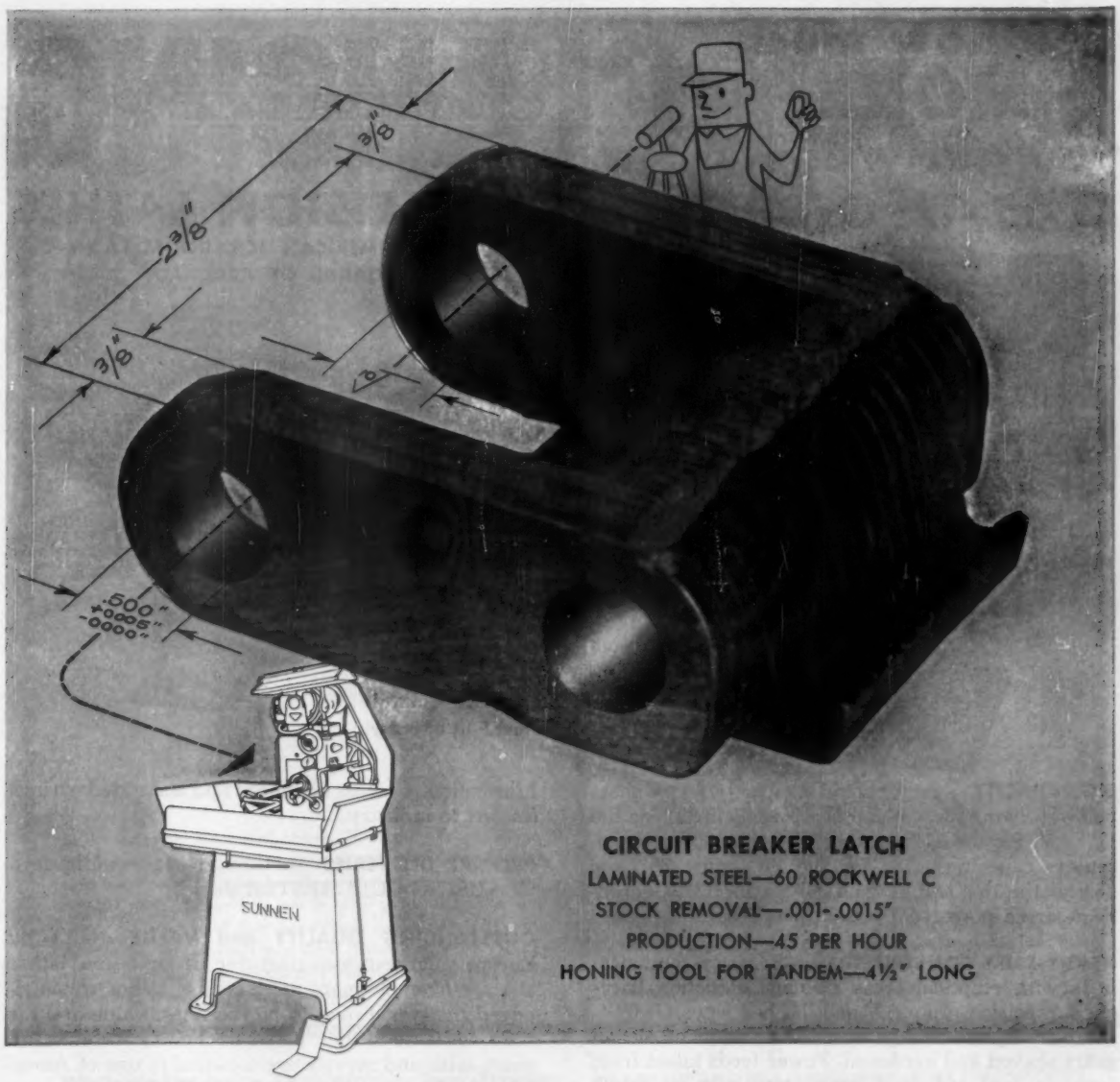

HOW TO ASSURE ALIGNMENT OF TANDEM BORES

Tandem bores are often a problem: Boring or grinding from one side requires a long quill or bar which tends to spring, jump and chatter. If you bore or grind from both sides, turntable error, wear or unequal stock removal can upset alignment. Reaming, too, can give you problems with tolerances, finish and alignment.

Your answer is Sunnen Honing! It assures perfect alignment, size and finish every time . . . for tandem and multiple-land bores. **Reason:** The spaced lands are all honed simultaneously . . . by a honing tool of sufficient length. The holes are *self-aligning* on the long honing tool.

No fixtures or turntable . . . no clamping distortion or tool deflection . . . no side pressure or tool chatter.

GET ALL THE FACTS ON SUNNEN HONING

SUNNEN®
PRODUCTS COMPANY
HONING

7920-A Manchester Ave. • St. Louis 17, Mo.

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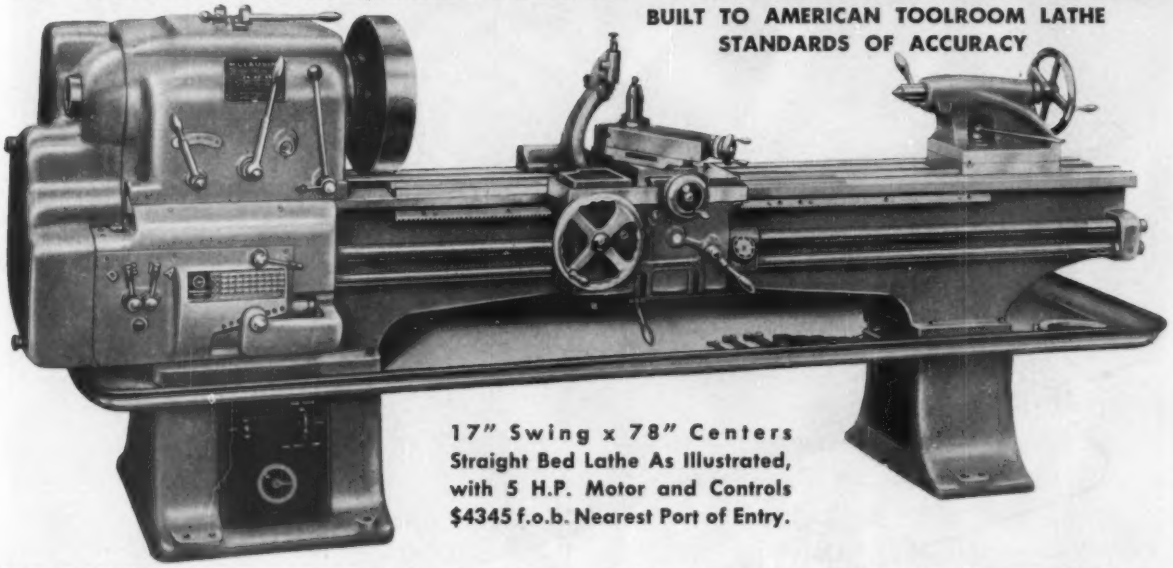
See how much MORE you get with... CLAUSING COLCHESTER

13"-15"-17" GEARED-HEAD PRECISION LATHES

BUILT TO AMERICAN TOOLROOM LATHE STANDARDS OF ACCURACY



17" Swing x 78" Centers Straight Bed Lathe As Illustrated, with 5 H.P. Motor and Controls $4345 f.o.b. Nearest Port of Entry.

BIG CAPACITY — larger spindle capacities (see chart below). Swing for the gap bed models is 29" for the 17"; 25" for the 15"; and 19" for the 13". Between centers capacities: 78" for the 17" lathe; 30" and 48" for the 15"; and 24" and 36" for the 13". Geared-head drive powered by multiple V-belts.

HEAVY-DUTY CONSTRUCTION — Massive semi-steel beds with elliptical cross ribbing. Induction hardened, precision-ground V and flat bed ways. Geared-head and quick-change box run in bath of oil, all gears shaved and hardened. Power feeds taken from separate feed rod, lead screw used only for screw cutting. Note size of spindles and spindle bearings (see chart in panel at right). Note, too, heavy-duty construction of tailstock, and of carriage assembly with double-walled apron.

PRECISION PERFORMANCE—built to American toolroom lathe standards of accuracy. Have GAMET MICRON tapered roller bearings . . . with oil flow lubrication . . . most advanced and accurate bearings known to industry.

PROMPT DELIVERIES — through your authorized CLAUSING-COLCHESTER dealer.

OUTSTANDING QUALITY and VALUE — built by Europe's largest manufacturer of precision lathes . . . for over 50 years producers of lathes acknowledged the world over to be the finest value and the most accurate in their class! Backed by the coast-to-coast sales and service organization of one of America's leading machine tool manufacturers . . . CLAUSING.

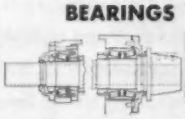
PRICES — 13" cabinet base models, including motor and controls, start at $1952, 15" cabinet base at $2744, 17" at $4345. All f.o.b., nearest port of entry. 5 straight bed and 5 gap bed models available. Two-speed motors available at extra cost.

WRITE FOR ILLUSTRATED LITERATURE

BIG SPINDLE CAPACITIES

CAPACITY	17"	15"	13"
THRU-HOLE	3 1/16"	2 1/16"	1 7/16"
NOSE TAPER KEY DRIVE	L-2	L-1	L-0

BIGGER BEARINGS



GAMET MICRON precision taper roller bearings with oil flow lubrication . . . the most advanced and accurate bearings known to industry.

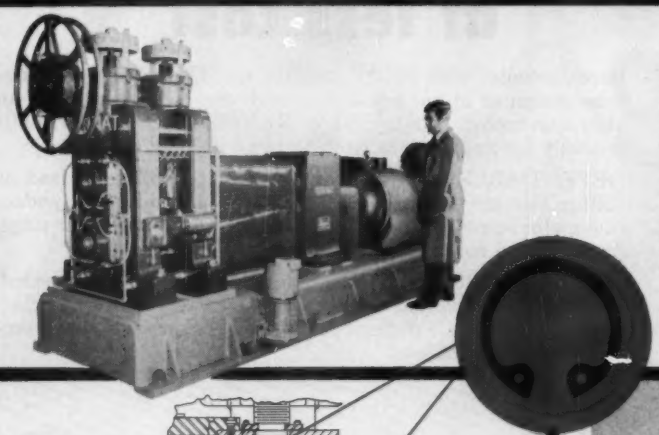
SIZE	17"	15"	13"
FRONT SPINDLE BEARING O.D.	7 1/2"	5 1/2"	4"

BUILT IN EUROPE'S LARGEST LATHE MANUFACTURING PLANT — BACKED, SOLD and SERVICED BY —

CLAUSING COLCHESTER

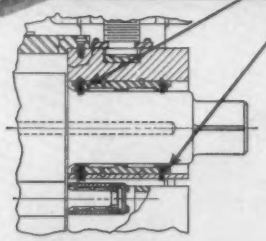
CLAUSING DIVISION
ATLAS PRESS COMPANY
1-101 N. PITCHER ST. — KALAMAZOO, MICHIGAN

7-inch Waldes Truarc retaining rings cut costs, speed assembly-disassembly of 2-high/4-high mill

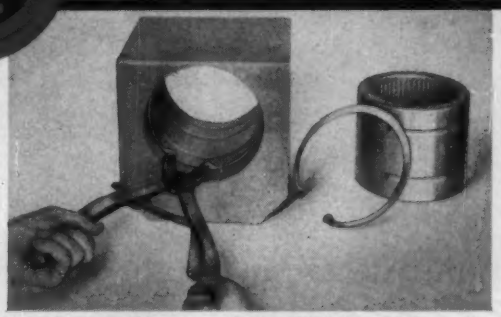


New Model TA-625 2-high/4-high combination rolling mill designed by Stänat Manufacturing Co., Long Island City, N. Y., reduces 2½" ingot to precision-rolled strip as thin as .001".

Waldes Truarc retaining rings help make possible a complete change of work rolls in 20 minutes...solve difficult problems of accuracy control by achieving positive location of bearings to extremely close tolerances. Rings eliminate costly parts and machining, save space, reduce maintenance.



In the assembly illustrated above, 7" Waldes Truarc (Series 5000) retaining rings—three on each roller—are used to position heavy-duty needle bearings in the bearing housing. Smaller rings position bearings in other roller assemblies and retain the shaft of a dual handwheel screwdown. All in all, 18 Waldes Truarc rings are used in the mill. They replace machined shoulders, spacers and lock nuts...eliminate costly threading, other machining operations.



Assembly is simple, even with giant 7" diameter Truarc ring. Special Truarc ratchet pliers grasp the ring securely, ease it into the groove, snap it securely into position. Smaller pliers and various high-speed assembly jigs are available for other rings, permit assembly-disassembly to be performed rapidly even by unskilled labor.

Whatever you make, there's a Waldes Truarc Retaining Ring designed to improve your product...to save you material, machining and labor costs. Quick and easy to assemble and disassemble, they do a better job of holding parts together. Truarc rings are precision-engineered and precision-made, quality controlled from raw material to finished ring.

36 functionally different types...as many as 97 different sizes within a type...5 metal specifications and 14 different finishes. Truarc rings are available from 90 stocking points throughout the U.S.A. and Canada.

More than 30 engineering-minded factory representatives and 700 field men are available to you on call. Send us your blueprints today...let our Truarc engineers help you solve design, assembly and production problems...without obligation.

For precision internal grooving and undercutting...Waldes Truarc Grooving Tool!

WALDES TRUARC® RETAINING RINGS

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Please send the new supplement No. 1 which brings Truarc Catalog RR 9-52 up to date.
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AM 61

WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,585,787, and other U. S. Patents pending. Equal patent protection established in foreign countries.

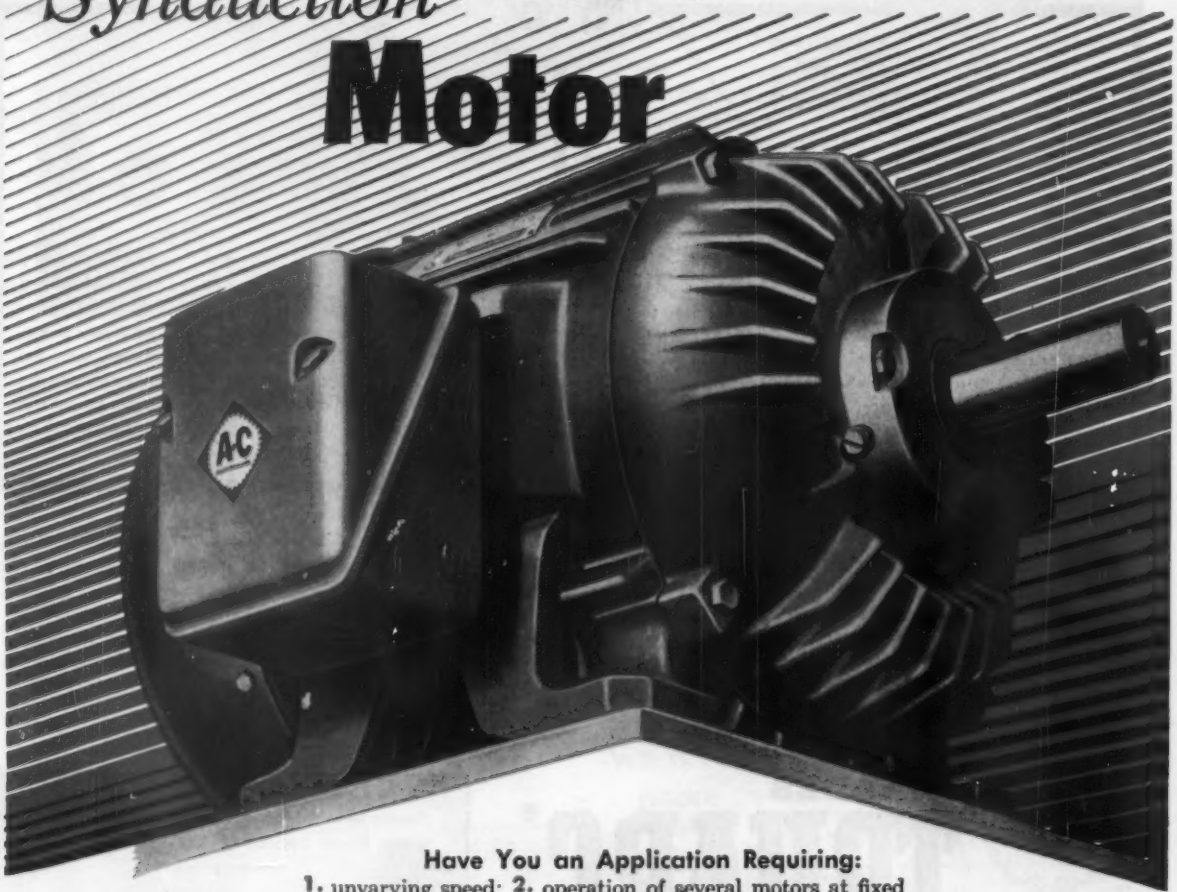
NOW dependable constant speed at less cost

Here's a motor with all the constant speed benefits of synchronous design at initial low cost — with the dependability of an induction motor. It's the NEW *SYNDUCTION* motor, built specially for applications from ¼ to 40 hp.

DEPENDABLE — Now constant speed, regardless of load or voltage changes, is sure . . . depends only on frequency. *Synduction* motor's simple die-cast rotor has no brushes, collector rings, nor insulated rotor windings.

LOW COST—Simple across-the-line control is all that's needed. Further, design permits use of frames smaller than usual reluctance-type motors. Purchase price is well below that of ordinary reluctance-type motors.

New *Synduction* Motor



Have You an Application Requiring:

1. unvarying speed; 2. operation of several motors at fixed speed ratios; 3. adjustable speed with minimum variation at any speed setting? If so, Allis-Chalmers invites your inquiry. Contact your nearby A-C office, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin, for Bulletin 51B8440.

Synduction is an Allis-Chalmers trademark.

A-C ALLIS-CHALMERS

A-5113

ALLIS-CHALMERS

Lapointe Machine Tool Company, Hudson, Massachusetts

FIRST OF ITS KIND IN THE WORLD!

...And It's Lubricated by Cities Service Pacemaker 400 T Oil!

LAPOINTE MACHINE TOOL COMPANY, originator of the broaching method of cutting metal over 50 years ago, has now originated the first vertical broaching machine with variable speed electro-mechanical drive.

Purpose of the huge, gear-driven machine is to increase tool life up to 500% through smoother operation, thus saving down time and producing more accurate work.

Selection of a lubricant for the new machine was of special importance because of the tremendous pressures it develops: normally 30,000 pounds, sometimes up to 60,000 pounds. Of the many brands of lubricants Lapointe tested, Cities Service Pacemaker 400 T had the necessary requirements for the job . . . so naturally, this superior lubricant got the job.

"We test the machines with Pacemaker 400 T at the factory and then put it in again when the broaches are assembled at the buyer's plant," says Lapointe. "It offers all the characteristics we need: Good film strength, high viscosity index, and exceptional anti-foam and anti-oxidant qualities. Needless to say, we're pleased and impressed with this Cities Service lubricant."

Like scores of others, Lapointe has discovered the search for a proper lubricant ends at the Cities Service label. Altogether, there are hundreds of Cities Service products for the exacting needs of industry. For more information, talk with your nearby Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

Quick Facts About New Broaching Machine

USES: Now used for broaching aircraft engine turbine buckets, but can be adapted to general broaching.

ADVANTAGES: Increases tool life 400-500% through smoother operation, less down time. Produces more accurate work. Variable cutting speed: 12 to 75 FPM. Available in single or double ram models with 72" to 100" stroke.

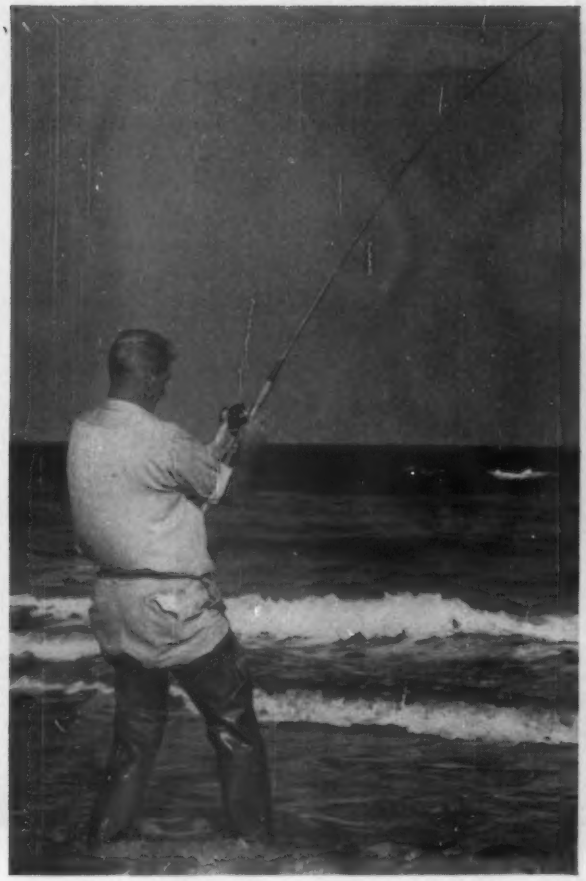
Quick Facts About Pacemaker 400 T Oil

USES: Propulsion turbine units where oil is circulated under heavy pressure. Widely used in naval and commercial vessels, high speed industrial machinery.

ADVANTAGES: High viscosity index, excellent heat resistance and film strength. Chemically fortified against oxidation, rust, and foaming.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS



Carpenter Free-Machining Stainless eliminates expensive handwork on fishing reel shaft

Excessive burrs when machining this level wind shaft for a fishing reel were constantly interfering with maximum productivity. Other important factors on the job are good corrosion resistance, and long wearing qualities.

Seeking improvement not only in the product, but also in its manufacture, the company decided to try Carpenter Stainless No. 5 (Type 416). The results were exactly as anticipated . . . easier, more uniform machining properties and burr-free finishes took the job out of the doubtful class and made it a profitable operation. No. 5 eliminated expensive hand work on the shaft, and put this job on a profitable, productive basis.

If you're not now using Carpenter Free-Machining Stainless, here's a real opportunity to improve production of stainless parts and products. For immediate delivery, call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor.

Carpenter STEEL

Free-Machining Stainless Steels

The Carpenter Steel Company, 109 W. Bern St., Reading, Pa.

Export Dept.: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

ROCKWELL-BUILT

new DELTA 20" drill press

...fills need for low cost production tooling

Delta's great new 20" Drill Press was designed, engineered and built to fill industry's growing need for *flexible* production tooling. Here is why it can save you money by handling jobs normally requiring machines *costing four and five times as much:*

BIG MACHINE CAPACITY—You get full 6" spindle travel and long 5½' high column for *extra* spindle to table capacity, backed by massive construction and rugged power to match! It's a real production tool for jobs ordinarily demanding big, expensive special-purpose machines.

POWER TOOL VERSATILITY—New Delta 20" can be used singly for a wide range of production jobs, yet readily adapts to work in combination with special-purpose machines. And you can move it *where you need it* to reduce materials handling, save costly man hours.

LASTING PRECISION—Delta's 30 years of unmatched quality power tool experience give you precision and performance features that assure exacting tolerances (and lower maintenance) through years of hard, continuous operation.

SEE THE ENTIRE DELTA DRILL PRESS LINE: Get all the facts about the new Delta 20" plus other new and improved Delta Drill Presses. Compare for quality, for precision, for value—and make up your *own* mind! Your Delta Dealer is listed under "TOOLS" in the Yellow Pages of your phone book.

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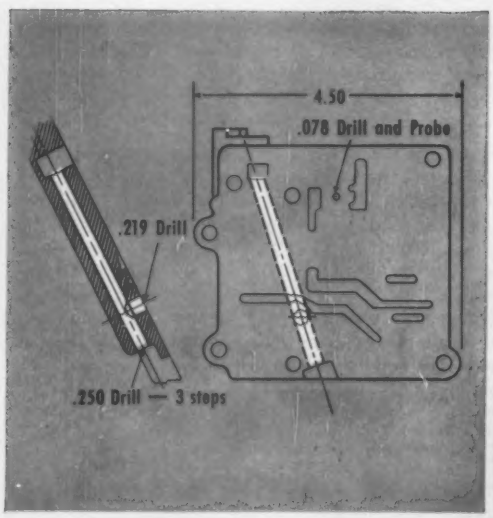
drilled and probed automatically in one chucking on a KINGSBURY

Case Study 3749

THREE HOLES
IN THIS TRANSMISSION VALVE COVER
. . . 5 OPERATIONS
. . . 350 PARTS PER HOUR GROSS



The machine drills three holes in this aluminum die casting. The customer asked us to probe the tiny .078 hole as the best means of inspection. An air-actuated mechanical probe operates at the next station after this drilling. If the hole is not drilled, the probe trips a limit switch which stops the machine.

We pioneered in these indexing automatics and we still think we can build them better than anyone else. They will produce to your specifications. If you have critical high production drilling and tapping jobs, we'd like a chance to show you what we can do. Kingsbury Machine Tool Corporation, Keene, N. H.

KINGSBURY
INDEXING AUTOMATICS
for high production drilling and tapping

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POP SAYS WAIT TILL HE USES A COUPLE OF DOZEN. THEN HE'LL KNOW!
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NICHOLSON U.S.A. **NICHOLSON FILE COMPANY, PROVIDENCE, RHODE ISLAND**
(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)
BLACK DIAMOND U.S.A.

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"He sets up 6,324,500 games a week!"

"The pin boy has been replaced in over 20,000 bowling alleys by our 'Mr. Pinspotter.'

"He's the symbol for AMF's completely automatic unit that sets the pins up and returns the ball in a matter of seconds!

"In many places 'Mr. Pinspotter' works 24 hours a day!

"He's *always* on the job for one good reason—Air Express!

"When an AMF automatic pinspotter needs spare or replacement parts, they leave our Shelby, Ohio, factory for every state in the country—even Hawaii and Alaska—by Air Express. Radio-controlled trucks cut pick-up time, often in half. Air Express private teletype 'keeps an eye' on the shipment.

"Yet, with all this speed and service, AMF actually saves money with Air Express. A typical 15-pound shipment goes from Shelby, Ohio, to Philadelphia for $3.71. That's $3.94 less than any other complete air service!"

Air Express

GETS THERE FIRST *via U.S. Scheduled Airlines*

CALL AIR EXPRESS . . . *division of* RAILWAY EXPRESS AGENCY

300 ton Pacific Hydraulic Brake is accurate within thousandths of an inch. Angles from top down are 90°, 116°, 100°, 120°, 166°.

Presetting controls for the different angles to be formed consecutively.

forms 7 different angles in succession without resetting controls

PACIFIC HYDRAULIC PRESS BRAKE

In a single handling of metal, Pacific Hydraulic Press Brake forms an entire series of different bends. You set the controls just once and run through the entire sheet or plate. Handling time is cut to a minimum. Operating on the "air bending" principle, the ram comes down to a different depth with each stroke forming the various angles preset on the controls. Each bend is accurate within thousandths of an inch. The length of stroke can be adjusted to match any job; bends up to 12" deep can be formed in a single stroke while the stroke can be reduced to less than 1/8" and the press will cycle 50 strokes per minute or more.

The ram is held level automatically by patented controls so that work can be done at any point along the entire length of bed. Thus a piece can be passed progressively from die to die for blanking, deep drawing, embossing, punching and forming. In punching, continuous power drives the punch through heavy plate with the shock being absorbed by the hydraulic cushioning of the cylinders. This Pacific Hydraulic Brake is also used for straightening, rubber pad forming, pipe making, stretching, extruding, hot forming and even shearing heavy plates. The Pacific cannot be jammed or overloaded and its precise accuracy is maintained indefinitely. Maintenance is low.

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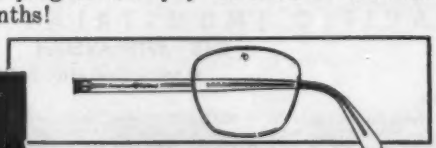
As a leading maker of quality safety equipment AO† works closely with safety directors in reducing the costs of industrial accidents. If you are considering an Eye Protection program, for example, call us in for complete facts and figures. The program can pay for itself in less than six months!

American Optical COMPANY
SAFETY PRODUCTS DIVISION



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For automation as for regular production, Circle R saws and other circular metal-cutting tools prove in practice the best you can buy—though they cost no more.

SPECIALIZED FACILITIES of 45,000 square feet make ours an exceptionally extensive facility devoted *exclusively* to the development and production of fine circular metal cutting tools.

QUALITY & COST are scientifically controlled. Profilometer indicates surface finish variations in micro-inches which will affect the dimensional tolerances. Magnaglow Inspection discards rejects for us before they reach our costly finishing stages, hence for you practically eliminates down time due to defects in cutting tools.

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SCREW SLOTTING SAWS
COMMUTATOR SLOTTING SAWS
JEWELERS' SLOTTING SAWS
CUT OFF SAWS • CIRCULAR KNIVES & ROTARY SHEAR BLADES • CIRCOLOY STEEL SAWS • SOLID & TIPPED TUNGSTEN CARBIDE SAWS
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PROVIDENCE 1, RHODE ISLAND
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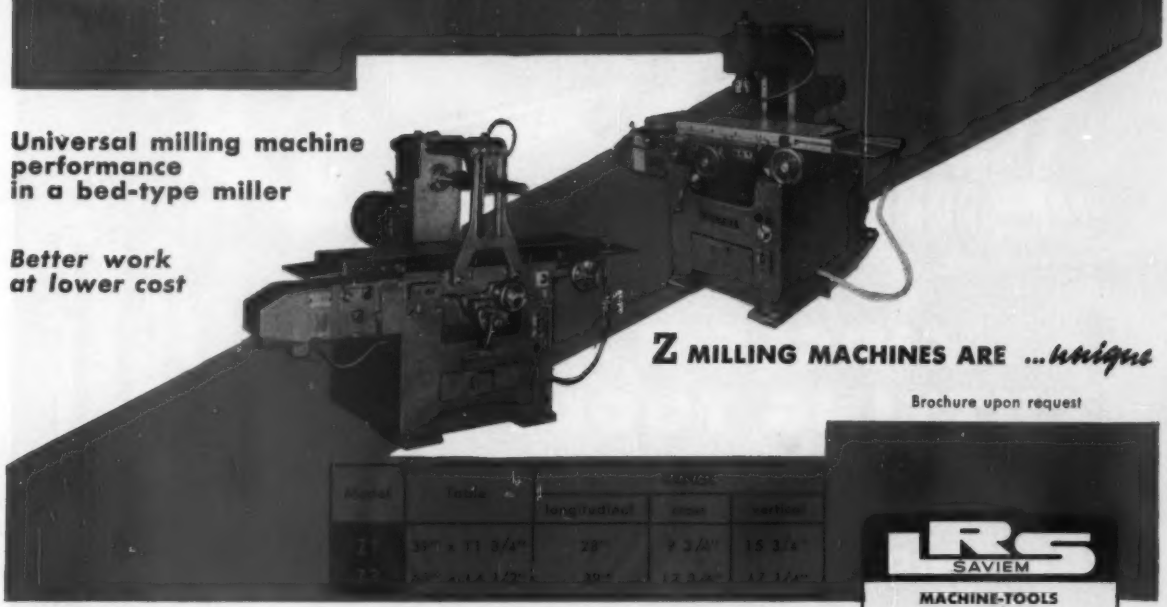

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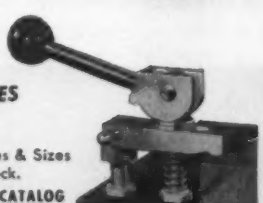
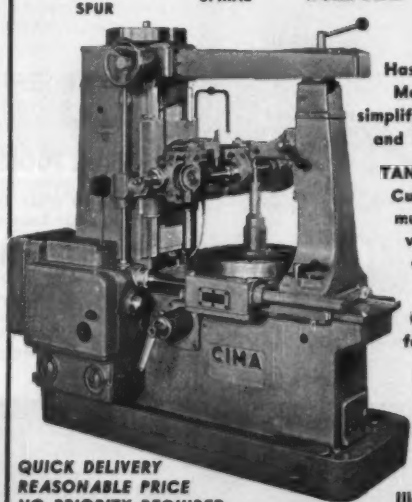


WEST POINT MFG. CO.
26935 W. 7 Mile Road, • Detroit 19, Michigan

CIMA UNIVERSAL GEAR HOBBING MACHINE

CAPACITY 20" DIA. 5 D. P.



Has **DIFFERENTIAL** Mechanism to simplify cutting spiral and helical gears.

TANGENTIAL Feed Cutter Head for multiple-thread worm gears and worms.

Employs **CLIMB CUTTING** for better finish.

Power Feed and Rapid Return in all directions - Quick set-up.

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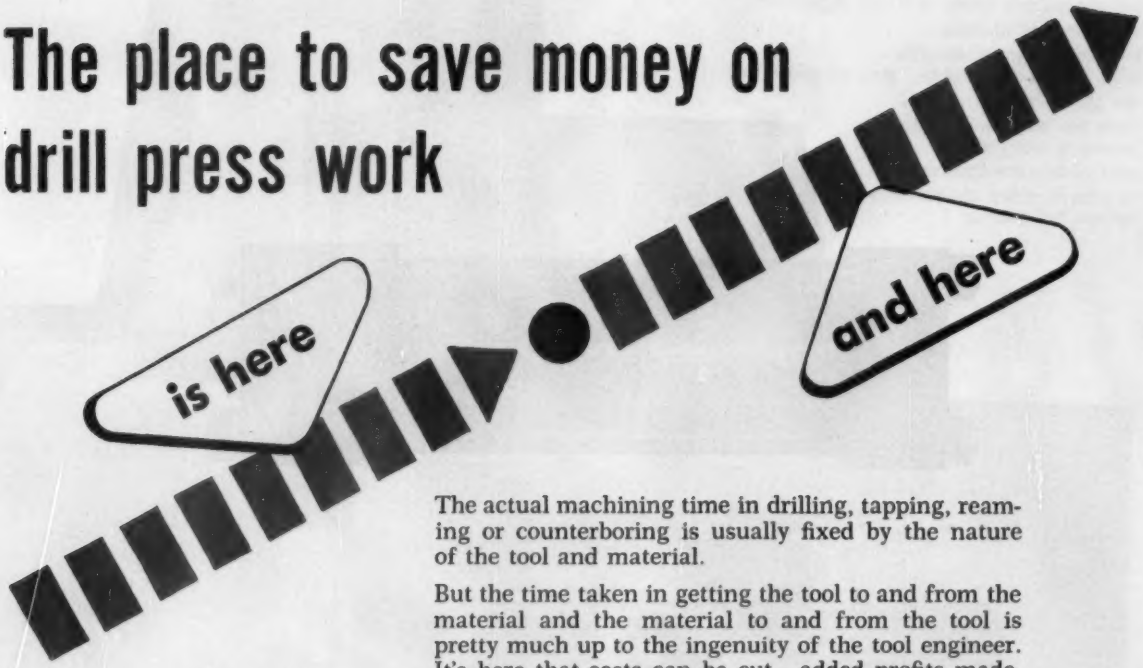
QUICK DELIVERY
REASONABLE PRICE
NO PRIORITY REQUIRED

GEORGE SCHERR CO., Inc.
COMPLETE LINE OF PRECISION INSTRUMENTS
200 AM LAFAYETTE ST. • N.Y. 12, N.Y.

The place to save money on drill press work



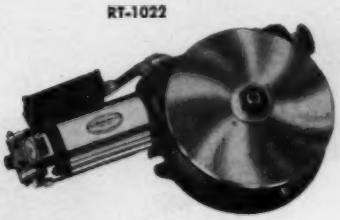
The actual machining time in drilling, tapping, reaming or counterboring is usually fixed by the nature of the tool and material.

But the time taken in getting the tool to and from the material and the material to and from the tool is pretty much up to the ingenuity of the tool engineer. It's here that costs can be cut—added profits made.

It's here that two Bellows "Controlled-Air-Power" Devices can fit into your picture: The Bellows Drill Press Feed and the Bellows Rotary Work Feed Table. The Bellows Drill Press Feed attaches to the star wheel shaft of any standard drill press. A touch on the operating lever and the Feed advances the quill rapidly to the work, feeds the tool under hydraulic control through the work—and returns the quill quickly to starting position. The Bellows Rotary Work Feed Table feeds the parts swiftly, accurately and safely to the tool. All the operator has to do is load and unload—the rest is automatic.

DF-110R

RT-1022



WRITE FOR THESE TWO FREE BOOKS

Quick reading facts that will help you make more money on your drill press operations. Write The Bellows Co., Akron 9, Ohio, Dept. AM-157.

In Canada: Bellows Pneumatic Devices of Canada, Ltd. Toronto, Ontario

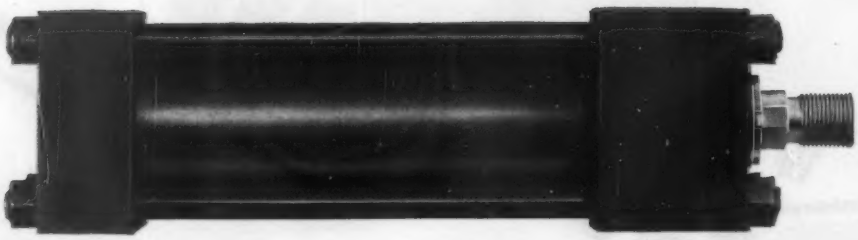
Ask for Bulletins DF-110R and RT-1022.

7368

The Bellows Co.

AKRON 9, OHIO

MANUFACTURERS OF "CONTROLLED-AIR-POWER" DEVICES FOR FASTER, SAFER, BETTER PRODUCTION



designed for leadership!

The superiority of Hannifin cylinders begins on the drawing board, where Hannifin designers have originated feature after feature not found in other air and hydraulic cylinders. But it doesn't end there...

Hannifin offers more kinds of cylinders, more sizes, more mounting styles. Each manufactured with such exacting control of dimensions and finishes that it not only looks like a better cylinder—its performance proves it!

As more and more discriminating specifiers and buyers are finding, the extra quality you get from Hannifin costs you no more, can usually be delivered sooner.

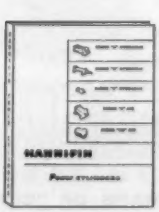
Why not specify Hannifin by name when you buy?

AIR AND HYDRAULIC

HANNIFIN

POWER CYLINDERS

Write for your copy of this new Hannifin Cylinder File—complete, easy-to-use, easy-to-order-from information on five lines of Hannifin cylinders. Hannifin Corporation, 517 S. Wolf Road, Des Plaines, Ill.



- 9" column; 3' or 4' arm
- spindle speed ratio of 40-to-1
- 12 speeds (up to 3200 rpm) through direct-reading dial
- automatic tapping reverse
- adjustable spring counterbalance (feel remains the same from lightest to heaviest tools)
- hardened tang slot
- safety elevating nut and screw (arm can't drop or overrun)
- hardened arm ways for head
- rigid accurate spindle mounted on 5 precision ball bearings

those who buy

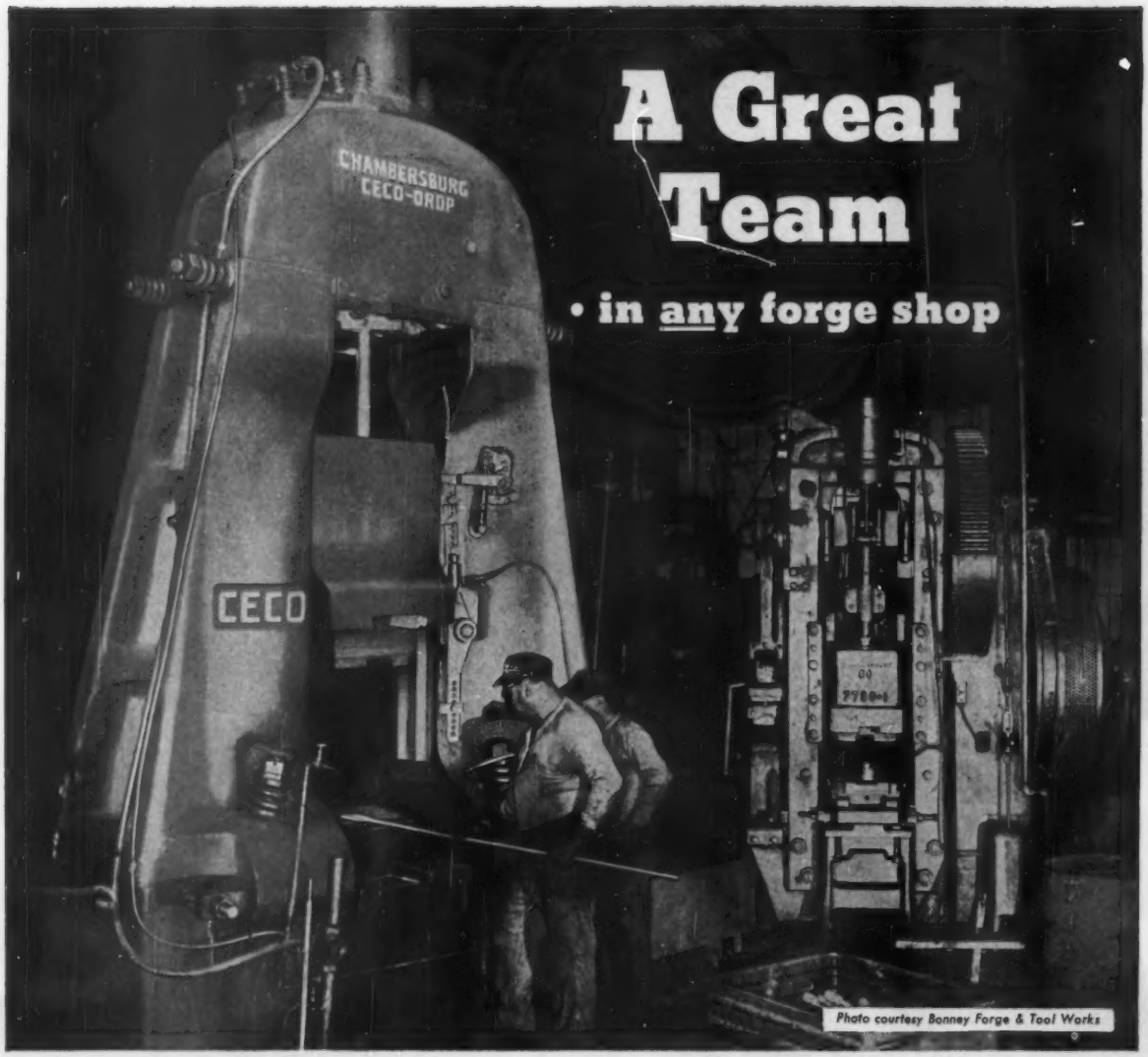
GILBERT

buy Gilbert again

newest *high-speed* radial

Your many demands for a high-speed light-duty radial are met—completely and economically—by this new Gilbert 3 hp machine. Compare the features at the right with other radials of equal capacity, and you see why the Gilbert is the best buy in its class. Traditional Gilbert accuracy, fast response, and wide-angle work visibility make your shop more productive, more versatile. Variety of bases, runway mounting, or tables available. Get all the details in Bulletin 255.

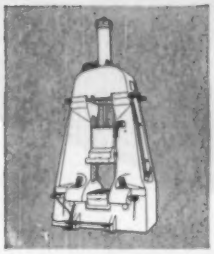
The Cincinnati Gilbert Machine Tool Co.
3350 Beekman Street, Cincinnati 23, Ohio



A Great Team

• in any forge shop

Photo courtesy Bonney Forge & Tool Works



CHAMBERSBURG CECO-DROP

- Piston-lift • Gravity drop
- Costs less to operate
- Forges more minutes per hour
- Forgings made faster
- Operation is easier and safer
- Maintenance is cheaper
- Full stroke or short stroke without interruption
- Over 400 in service in over 100 forge shops

Ceco-Drop and Trimmer

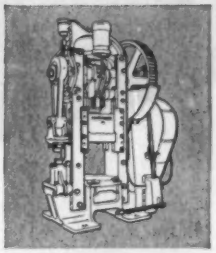
• • *for top production*

When the chips are down, it is continuous, trouble-free, quality production that puts you ahead of competition. That fact explains why the Ceco-Drop (in combination with the "indestructible" Chambersburg Trimmer) has become in nine short years, the standard gravity drop hammer of the forging industry.

Write for descriptive Bulletins

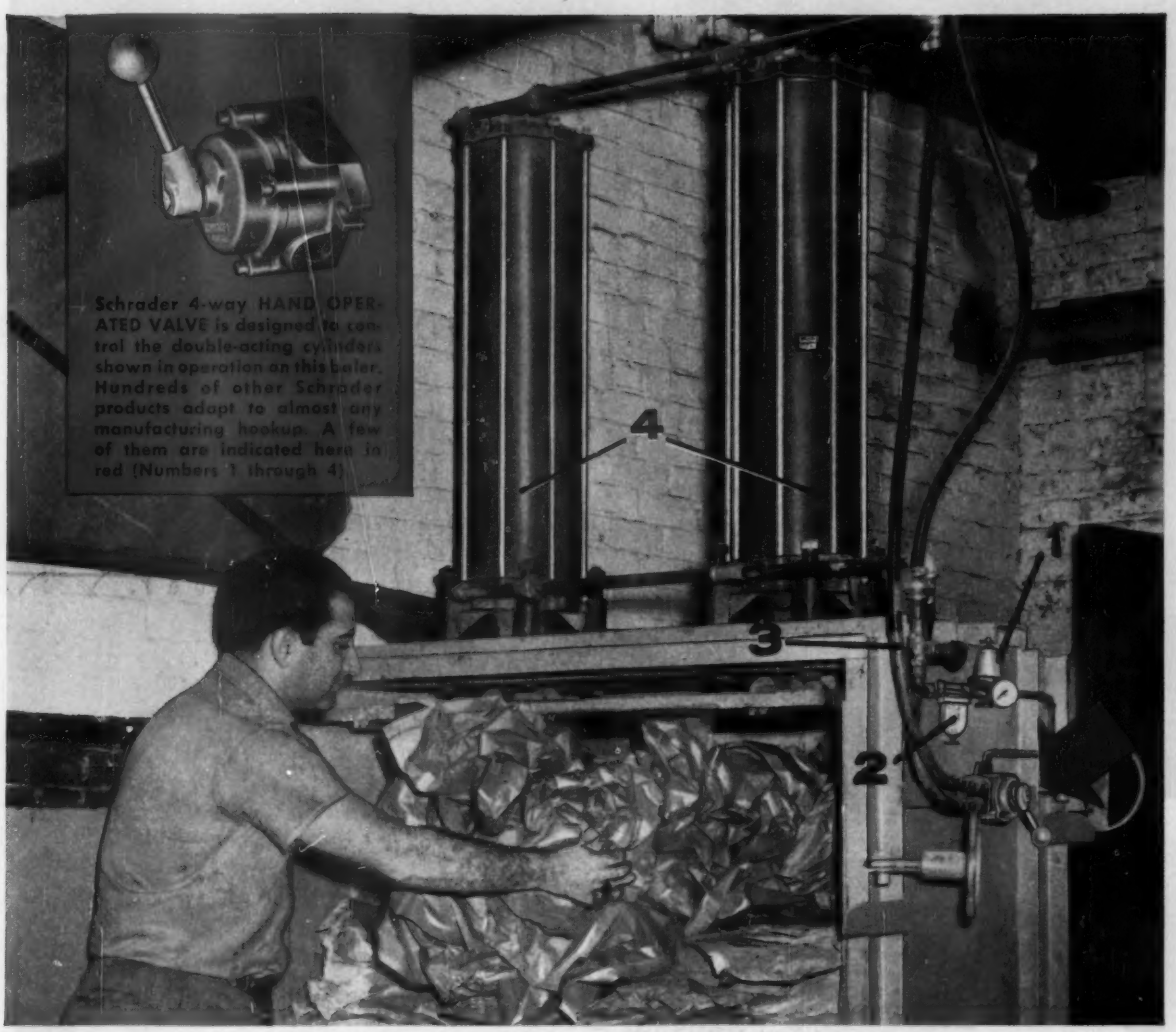
CHAMBERSBURG ENGINEERING COMPANY
CHAMBERSBURG PENNSYLVANIA

ALSO BUILDERS OF THE IMPACTER



CHAMBERSBURG FORGED STEEL SIDE TRIMMING PRESS

- Exceptional strength
- Jam-proof. Functions perfectly after stall-test
- Uses minimum floor space
- Accessible front and back
- Friction-slip Flywheel
- Interlocking forged steel side construction
- Low power consumption
- Safe
- Single or Double Crank.


Schrader 4-way HAND OPERATED VALVE is designed to control the double-acting cylinders shown in operation on this baler. Hundreds of other Schrader products adapt to almost any manufacturing hookup. A few of them are indicated here in red (Numbers 1 through 4).
4
1
3
2

How Schrader Air Products bale paper, producing 4 ton pressure with 100 lbs. of air

At this Rhode Island dye works, the paper baling operation formerly was a fatiguing manual chore. Now, the operator simply fills the press with used paper and cartons, and pulls a 4-way hand valve. One hundred pounds of air pressure flowing through the two Schrader double-acting cylinders then compress the paper with four tons of force. Finger-tip adjustments can reduce or raise pressure quickly, easily.

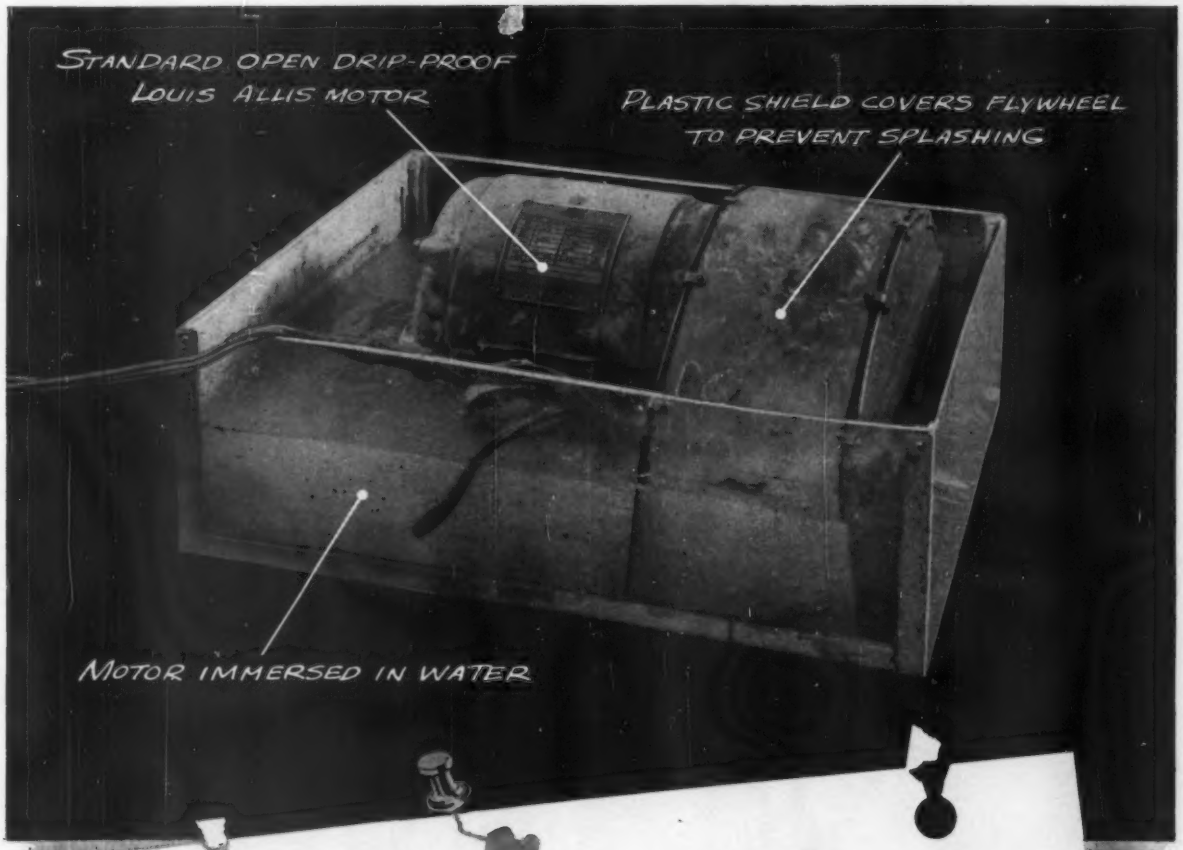
Safe, simple, fast—compressed air daily performs miracles in hundreds of different ways. More and more manufacturers think "air" when they think "automation." Holding work, moving scraps, synchronizing actions—all such operations can be automated with Schrader Air Products.

Air means economy, too. Upon request, Schrader engineers will assist you in planning for the most efficient use of air and in selecting the products best suited to your applications. Tell us your problems. We'll be glad to help. Or send for the latest informative booklets.

Schrader®
ESTABLISHED IN 1844

A. SCHRADER'S SON
Division of SCOVILL
460 Vanderbilt Avenue, Brooklyn 38, N. Y.

FIRST NAME IN THE USE OF AIR
FOR INDUSTRIAL PRODUCTION AND CONTROL



In water 1½ years...still running

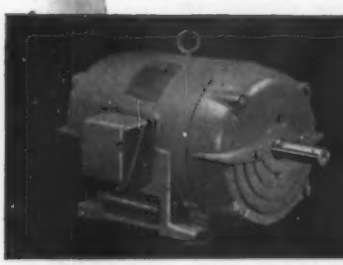
Dramatic proof that Louis Allis motor insulation provides unusual moisture resistance

We wouldn't do this to a motor. But somebody did, to check our new insulation. They took a standard open drip-proof motor, placed it in water up to the shaft, and ran it a year and a half.

The motor will still run, too, which proves that our insulating materials are of top quality. One of our exclusive features is the new phenolic impregnating varnish we use. As you can see, this varnish resists moisture, but it also has excellent thermal and chemical resistance and is not susceptible to embrittlement.

Insulation usually determines the life of a motor. That's why the insulating materials used in the new L. A. line are the product of years of continuous research and development. That's why Louis Allis motors run longer . . . give less trouble.

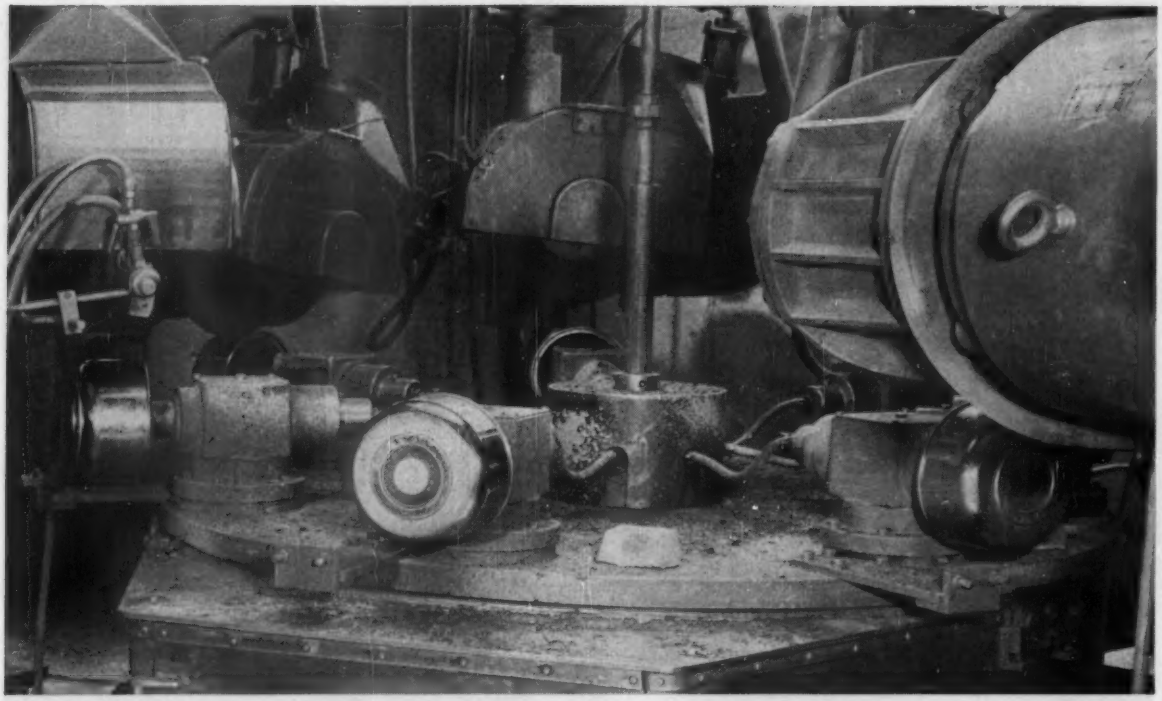
Find out the many other advantages available to you in the new L. A. line of motors. Write for our new bulletin No. 1700.



A complete line of standard rerated motors in frames 182 through 326U now in stock. Special rerated motors are available on short delivery.

LA-107

THE LOUIS ALLIS CO.
MILWAUKEE 7, WISCONSIN



DORMEYER Corporation finds . . .

Automatic finishing with 3M "PG" Wheels cuts costs 66%

Dormeyer Corporation, nationally known Chicago appliance manufacturer, was using sisal buffs on a six-station rotary automatic machine to finish their stainless steel mixing bowls. This method was expensive, with daily production averaging 2200 bowls, and many rejects.

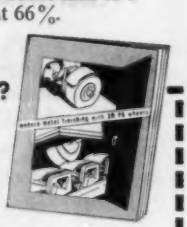
A 3M Engineer suggested that this company install 3M "PG" Wheels (made of hundreds of pieces of die-cut coated abrasives) on the first three stations of the automatic machine; a Grit #280 "PG" Wheel at the first station, a Grit #320 at the second and a Grit #400 at the third, all lubricated with liquid tripoli. The last three stations remained color buffs.

Results: production increased nearly 25% to 2900 finished units per day, and rejects were eliminated! Each "PG" Wheel finishes an average of 50,000 bowls—compared to 1700 for each sisal buff—thus cutting down-time to a minimum. Over-all finishing costs were cut 66%.

PERFECTLY ADAPTED TO AUTOMATIC FINISHING. If you now have or are planning to install an automatic finishing operation, it will pay you to get full facts on the 3M "PG" Wheel. Call your 3M Representative today, or send the coupon.

3M® ABRASIVES

WANT MORE INFORMATION?



Minnesota Mining and Manufacturing Co.
Dept. AK-17, St. Paul 6, Minnesota

☐ Send me full details about 3M "PG" Wheels

☐ Please have a 3M Representative call

NAME.....TITLE.....

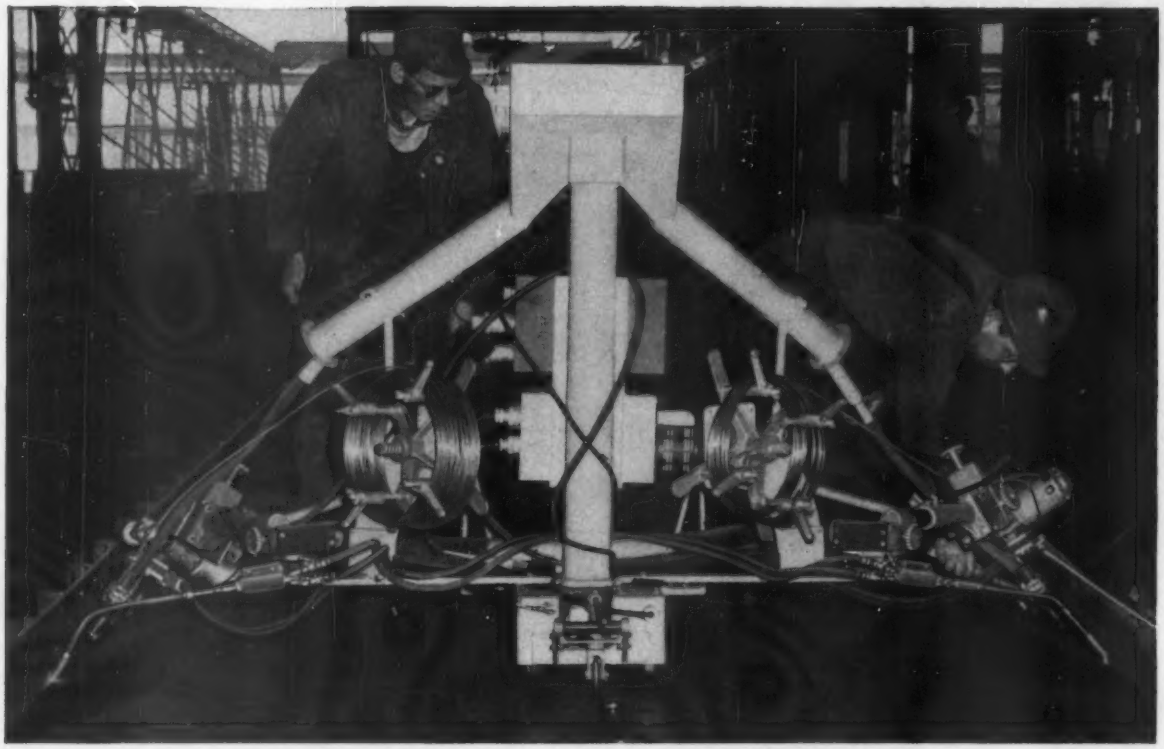
COMPANY.....

ADDRESS.....

CITY.....ZONE....STATE.....

PRODUCT OF 3M COMPANY RESEARCH

Made in U.S.A. by MINNESOTA MINING AND MFG. CO. General Offices: St. Paul 6, Minn. In Canada: P.O. Box 757, London, Ontario. Export Sales Office: 99 Park Avenue, New York City.



UNIONMELT *welding simplifies and speeds fabrication of giant steel beams.*

two heads are better than one

PARTICULARLY WHEN THEY'RE "UNIONMELT" WELDING HEADS

Mounted on a single LINDE machine carriage with a common composition hopper, dual UNIONMELT welding heads enable fabricators of steel beams to—double production speed, produce premium quality welds, and cut equipment costs.

In this highly efficient installation welding controls are within easy reach of the operator. He can clearly observe welding conditions, and make any amperage or voltage adjustment necessary. Another feature used here is a grooved, magnetic track which provides a sure course for the carriage guide wheel to travel as welding heads move over their work . . . Welding is fast, and operations are simple.

UNIONMELT Welding Features

Extreme depth of penetration—the ability to make welds up to 1½ inches thick in a single pass—plus high welding speeds make UNIONMELT welding the most economical process for a wide range of fabricating and repair jobs. Equipment is available in both portable manual machine, and automatic machine installations.

For complete information on UNIONMELT welding, or for technical assistance in planning your new welding installation, call your local LINDE representative or write for free illustrated literature.

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto

The terms "Linde" and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation.

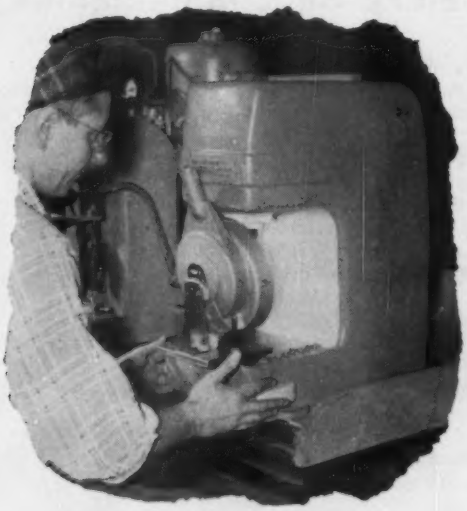
Linde Trade-Mark

Investigate Production Savings

made possible by Denison's 1-Ton Multipress

No scrap Riveting electrical controls in bakelite cases with the 1-ton Multipress has virtually eliminated breakage for Therm-O-Disc, Inc., Mansfield, Ohio. The press ram automatically reverses when the pre-set pressure of 900 pounds is attained.

Twice the output Three 1-ton Multipresses are used for broaching, burnishing and stripping operations at Lamson & Sessions, Cleveland, Ohio. Production was doubled over previous methods; pinpoint accuracy is obtained with semi-skilled operators.



Higher quality Peening studs less than ¼" long was a ticklish job made easy by the 1-ton Multipress. Health-Mor, Inc., Cleveland, Ohio, manufacturer of vacuum cleaner parts, has found that ease of Multipress operation greatly improves product quality.

Let Multipress point the way to production economy

DENISON HydrOILics

For complete information, write:

DENISON ENGINEERING DIVISION

American Brake Shoe Company

1164 DUBLIN ROAD • COLUMBUS 16, OHIO

drilling

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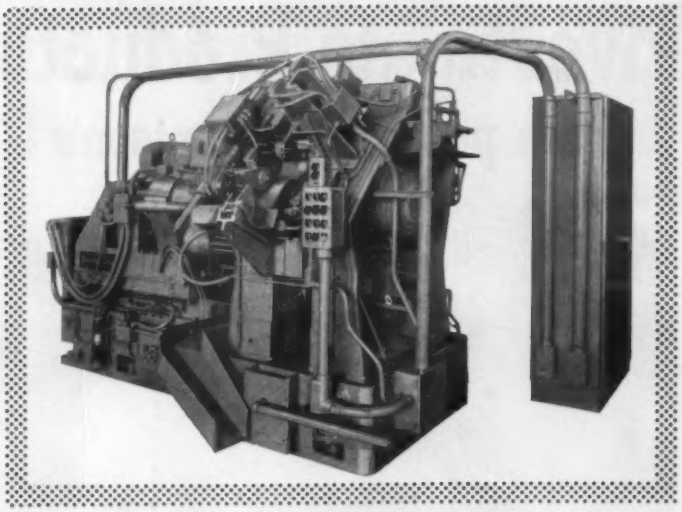


FULLY AUTOMATED PRODUCTION

8000

operations per hour on BARNESDRIL special production machine

Maximum output with fully automatic production is obtained from this Special BarnesdriL Production Machine, due to continuous machining with no time necessary for operator actuation.

Gear blanks are fed by conveyor from automatic lathes to the loading station on the machine. Here a loading arm picks up each blank and the machine clamps it in the holding fixture. Blanks are drilled, chamfered, reamed and tapped on each of ten holes per blank, or a total of 8000 operations per hour. After drilling a probing unit automatically gauges holes for size. The machine after completing the cycle discharges blanks into a chute for conveyor removal. In case of inadequate depth of holes or broken tools, a warning signal appears and the machine stops automatically.

If you have parts requiring high speed automatic production, consult BarnesdriL engineers for estimates and production recommendations. Full range of cycle operations are available with cycle time engineered to meet production requirements.

WRITE FOR BULLETIN NO. 150D

DETROIT OFFICE: 3419 South Telegraph Road, Dearborn, Michigan

BARNES DRILL CO.

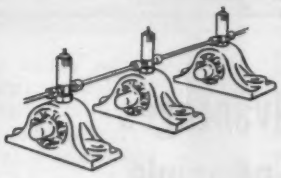
830 CHESTNUT STREET • ROCKFORD, ILLINOIS

Just 4 Easy Steps to Automatic Lubrication From One Central Point

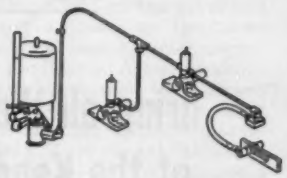
with an ALEMITE Accumatic® System

FASTER . . . FOOLPROOF . . . LESS COSTLY!

Replace grease cups or grease fittings with Accumatic fittings. (Available in same thread sizes as grease fittings, cups.)



Connect Accumatic fittings with copper tubing. (Alemite has tubing, clips and accessories for easy installation.)



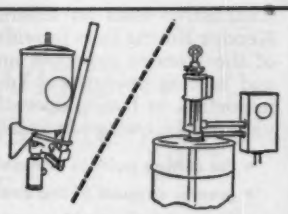
Connect sliding, rotary or oscillating parts into tubing system. (Flexible hose and swivels for moving parts.)

The fitting that "thinks for itself!"

The Alemite Accumatic System eliminates the work, worry and "human error" of manual lubrication. It fits directly on bearings—meters an exact shot of oil or grease automatically—at predetermined intervals—while the machine operates. Cuts labor, production and maintenance costs!

Factory-tested—field-proved!

Grueling field tests show no appreciable variation in the amount of lubricant discharged after 73,312 cycles—equal to *122 years of twice-a-day service!*



Provide central pump to supply lubricant to system. (Ordinary hand pump or fully automatic barrel pump.)

ALEMITE ACCUMATIC ADVANTAGES!

- Prevents application of wrong lubricant.
- Seals completely against damaging dirt, grit and water.
- No parts are neglected—lubricates inaccessible and dangerous bearings at regular intervals.
- Eliminates product spoilage due to over-lubrication.
- Eliminates point-by-point lubrication methods—services all bearings in one operation.
- Delivers exact amount of lubricant to bearing.

FREE! Alemite Accumatic Catalog

Alemite, Dept. C-17
1850 Diversey Parkway, Chicago 14, Illinois

Please send me my free copy of the complete Accumatic Catalog.

Name .....

Company .....

Address .....

City ..... Zone ..... State .....

ALEMITE
REG. U. S. PAT. OFF.

A Division of STEWART-WARNER CORPORATION

STEWART SW WARNER

Now... KENDEX* boring bars

bring all the advantages of the Kendex principle to turret lathe boring operations

Exhaustive tests on different turret lathes** prove that Kendex Boring Bars provide all the benefits and economies of the Kendex principle now enjoyed in turning, facing, and milling operations. In addition, and probably more important in boring operations, Kendex Boring Bars provide the following advantages over other types of bars:

- **the cutting point is brought down to the center line of the bar**
- **greater support of the cutting edge is provided**
- **better chip control (uses standard Kendex chipbreaker plate)**
- **boring operations performed better at higher speeds made possible with Kendex bar**
- **permits use of thin insert—greater resistance to thermal shock**
- **throw-away insert permits use of harder grades—greater resistance to edge wear at higher speeds**
- **cutting inserts index accurately (saves time on size adjustment)—less downtime**

Kendex Boring Bars, with the right grade of "throw-away" Kennametal* insert, can be used for both rough and finish boring of pieces up to several inches in diameter. The bar with 15-degree lead angle and square insert together with the bar for turning to a square shoulder with a triangular insert will take care of practically all boring operations—thus eliminating the need for a variety of styles.

Why not call your Kennametal tool engineer to demonstrate these new Kendex bars? He will also help you select the right grade of Kennametal insert for each boring operation. Or write for additional information, KENNAMETAL INC., Latrobe, Pennsylvania.

*Trademarks

**Tests made on Warner-Swasey, Jones & Lamson, Gisholt and other turret lathes

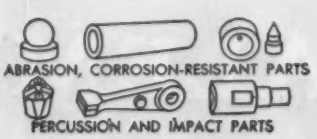
C-2003

Kendex Boring Bars for Turret Lathes with Kennametal "throw-away" inserts . . . eliminate costly grinding . . . index accurately without resetting tool . . . reduce machine downtime . . . slash cost per cutting edge . . . resist thermal shock . . . permit boring to close tolerances . . . better chip control (chipbreaker not shown in illustration at top of page)

MINING, METAL AND WOODWORKING TOOLS

WEAR AND HEAT-RESISTANT PARTS

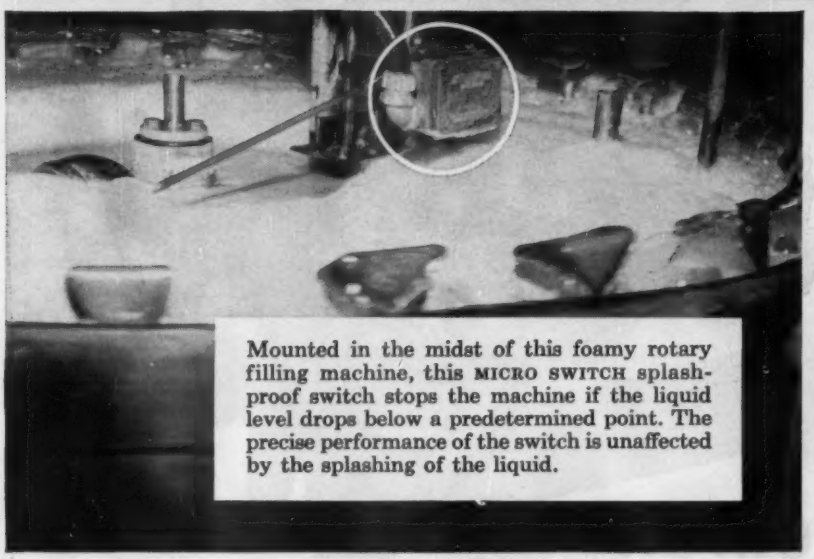
INDUSTRY AND KENNAMETAL ...Partners in Progress



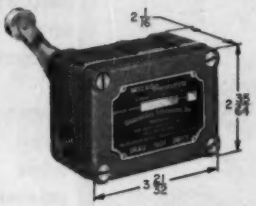
ABRASION, CORROSION-RESISTANT PARTS

PERCUSSION AND IMPACT PARTS

MICRO SWITCH . . . FIRST IN PRECISION SWITCHING



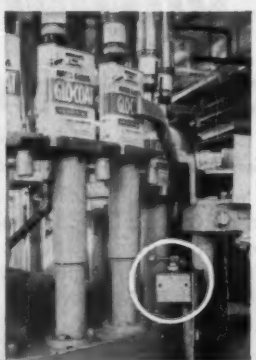
Mounted in the midst of this foamy rotary filling machine, this MICRO SWITCH splash-proof switch stops the machine if the liquid level drops below a predetermined point. The precise performance of the switch is unaffected by the splashing of the liquid.

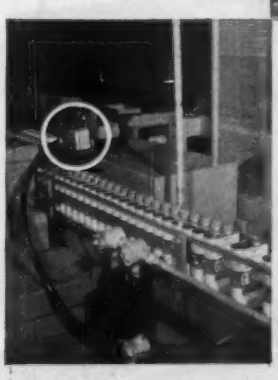


MICRO SWITCH Splash-Proof Switches are constructed to resist the splash of liquids. A seal on the actuating shaft and a gasket on the cover gives a good seal against normal splash conditions. A heavy aluminum housing protects the enclosed switch. These switches combine long electrical life with accurate repeatability. They are available with adjustable roller-arm actuators (shown) or with push-rod plunger actuators. Can be supplied with a variety of electrical ratings and contact arrangements.

Splashed all day with liquid wax...

MICRO SWITCH precision switch is used to prevent "jam up" on a rotary can-filling machine. If the platform sticks and does not lower to the level of the conveyor, the switch stops the conveyor until trouble is corrected.





Switch at the left is held operated by the nozzles of the cans. Should a can be upset, or reversed, the switch actuator releases, opens the circuit and the conveyor stops. Another switch keeps track of the supply of knock-down shipping cases, in a similar manner. It stops the conveyor if the supply is low.

MICRO SWITCH Precision Switch performance is unaffected

MICRO SWITCH controlled equipment is faster and more efficient—produces more in less time. Thousands of plant superintendents, electricians and maintenance men have made their equipment "perk up" with MICRO SWITCH precision switches.

Johnson's Wax Company engineers chose splash-proof MICRO SWITCH precision switches to control packing equipment in their modern Racine plant. From controlling the level of the rotary filling machine, through every packaging step, MICRO SWITCH units insure safe, efficient operation as over 200 cans are filled in each line per minute.

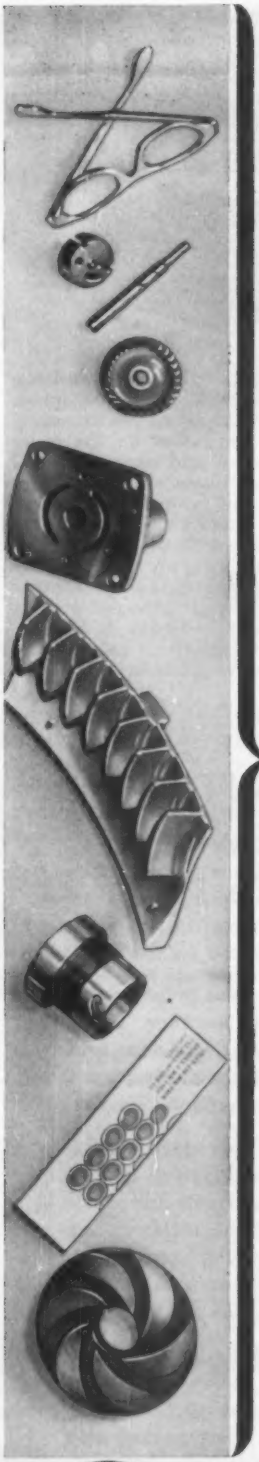
There is a MICRO SWITCH distributor near you. Let him show you a variety of switches and practical applications that have paid off for others. Send for MICRO TIPS DIGEST. It's jam-packed with ideas.

See MICRO SWITCH Catalog No. 83 for complete information on the wide line of heavy-duty precision switches for industrial use. Wire today.

MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

In Canada, Leaside, Toronto 17, Ontario • FREEPORT, ILLINOIS



A few examples of work produced on Gorton Pantographs at substantial savings in time and money

240 PIECES PER HOUR

This fuse part, of No. 1213 steel, has a serpentine groove with irregular radii. Two pantograph cutters rough out and the other two finish parts in pairs. Groove is .1903" wide, plus .0014", by .109" deep, plus .003". Finish: 35 mcr.

GORTON

Multiple Pantographing

Volume Production • Precision Tolerances

Tool room accuracy with production line speed is characteristic of Gorton Pantographs. These versatile machines will turn out a dozen . . . or a million . . . finished pieces from one setting with no perceptible variation in required tolerances. From two to six different operations can be performed at each setting with all operations completely automatic within the cutting cycle. In fact, output is limited only by the capacity of the cutter. Spindles turn at 900 to 45,000 RPM providing infinitely variable cutting speeds and feeds.

Shape of part matters little. Two or three-dimensional cutting can be performed on flat, cylindrical, spherical, square or irregularly shaped work. 16 Pantograph models cover a wide range of applications in profiling, grooving, slotting, milling, chamfering, graduating, counter boring, die sinking, mold making, routing, engraving, grinding, burnishing and etching. Models provide manual, semi-automatic and fully automatic cycling. Custom built.

Write for Bulletins 1655, 2595-DS, 2604-DS, 1501.

New P1-2 heavy-duty model with ⅜" spindle capacity and ½ HP motor available

GORTON

GEORGE **GORTON** MACHINE CO.

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Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

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HOLE-MAKING SOLVED FROM START TO FINISH

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You name it . . . any hole, any hole-making problem. Your Madison Man has the solution — how to machine it best at least cost. He'd like to stop at your plant and discuss your specific problems. Just drop us a note or send coupon to Dept. AM-1.

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WELDED CARBIDE-TIP TOOLS

for all hard metals, ceramics, glass and plastics

DU-BAR®

Boring bar with welded tungsten-carbide tip. Will cut any metal or plastic. Will not fail under self-generated heat.

DU-DRILL®

Drill with welded tungsten-carbide tip. Cuts anything between Rockwell C-38 and C-84. Will not anneal, burn or melt.

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Counterbore with welded tungsten-carbide tip. Unaffected by highest cutting temperatures. Higher cutting speeds.

DU-MILL
T.M.

End mill with welded tungsten-carbide tip. Mills ordinary metals at high speed plus hard metals, ceramics, glass and plastics.

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space problems?

better check . . .

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METAL WORKING EQUIPMENT

GUILLOTINE BEAM PUNCH (left) — Punches flanges and webs of beams. Requires less floor space, lower first cost and extreme rigidity for longer tool life. Full capacity loading and punching across face of ram. 150, 200 and 350 ton models. **GUILLOTINE BAR SHEAR** (right) — For production or "short order" shearing of rounds, squares, angles and bars, without changing tools. Cap. 43 to 300 ton.

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Stahl craftsmanship supplied this answer to heavy industry's need for a precise, durable spur gear to be used on a 60 ton crane. For similar, or widely varied uses, Stahl has the precision facilities to more than satisfy your gear needs—in any material, in any quantity. Get our estimate.

SPURS TO 72" PD, 1 DP
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RACKS TO 20 FT. LONG, 3 DP
SILENT GEARS; RAWHIDE, BAKELITE, FIBROIL
HEAT-TREATED, CASE OR FLAME HARDENED GEARS — OF CARBON OR ALLOY STEEL

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GEAR & MACHINE COMPANY
3901 Hamilton Ave. Cleveland 14, Ohio

"Don't just sit there! Find out what HELLER TOOL will announce on Feb. 1!"

Chipping and Edge Breakdown Eliminated by Switching to **STELLITE** *Alloy Tools*

HAYNES STELLITE Star J-Metal tools mill an average of 220 of these cast iron differential housings per grind despite periodic contact with hard white iron spots. Chipping and edge breakdown, major problems when other tool materials were used, have been eliminated by switching to STELLITE alloy tools. As a result, unscheduled down time has been drastically cut. About 3/16 in. of stock is removed from each casting with 0.010 to 0.012 in. chip load per tooth. Cutting speed is 88 surface ft. per minute. The 40 standard Ingersoll-type blades mounted in a 12-in. cutter can be counted on for a full shift's production.

HAYNES STELLITE alloy tools are successful on applications like this one because they have good impact strength, high compressive strength, and their cutting edges remain hard and sharp even when red hot. They resist chipping and spalling in spite of severe shock. Metal removal is fast because high speeds, comparatively high feed rates, and deep cuts can be used.

For more information on efficient metal removal with HAYNES STELLITE tools, write for the booklet, "HAYNES STELLITE Metal-Cutting Tools." It gives information on chip formation, tool design, and grinding procedures.

"Haynes", "Haynes Stellite", and "Stellite" are registered trademarks of Union Carbide and Carbon Corporation.

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HAYNES STELLITE COMPANY

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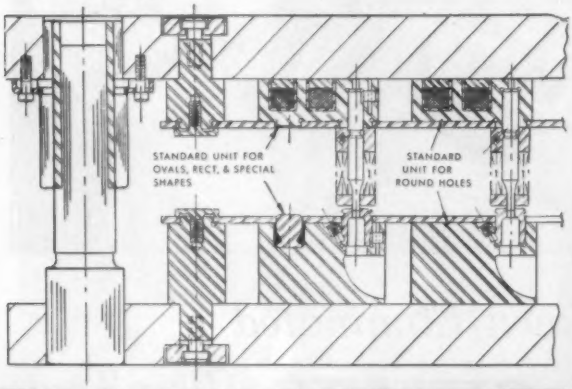
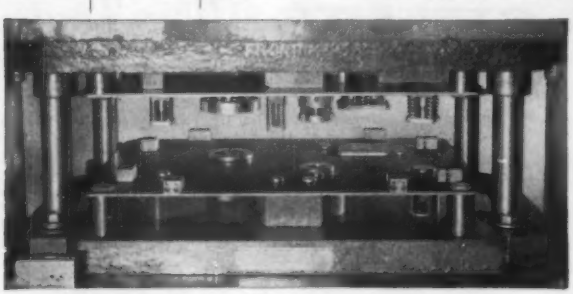
• Operate like a single-purpose die • All punch and die parts interchangeable • Pierce metals up to ¼" thick steel • Changes made from one operation to another while the die set is in the press • Change-over time from 5 to 20 minutes, depending upon size of die set • Lower die costs • Saves die storage space • Precision work in any size press • Backed by Whistler's 40 years of die making experience serving the nation's leading plants.





YOU NEED THIS CATALOG... Shows by photos, drawings and prices how the Magnetic Die* system drastically cuts die costs, saves valuable time, speeds production. *Write for it today.*

**Whistler Magnetic Dies are fully patented and are sold under the registered trade name Magna-Die.*

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ADJUSTABLE, MAGNETIC and CUSTOM DIES FOR ALL INDUSTRY
Direct Factory Representatives Located in Principal Industrial Areas

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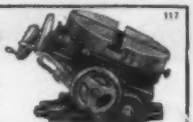
PALMGREN ROTARY AND INDEXING TABLES
Used in all industries — Everywhere

No. 86 8" Rotary Indexing Table $89.95

There are 64 different models and types of Palmgren vises, rotary tables, milling attachments and other machine tool accessories — the most complete line of vises and tables available anywhere.



No. 84 8" Tilting Indexing and Rotary Table..$139.50
Write for Catalog 204

CHICAGO TOOL AND ENGINEERING CO., 8368 S. Chicago Ave., Chicago 17, Ill.

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See the Index of Products Advertised in each issue. You'll find products advertised classified by type with page numbers of the advertisements.

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GRANT

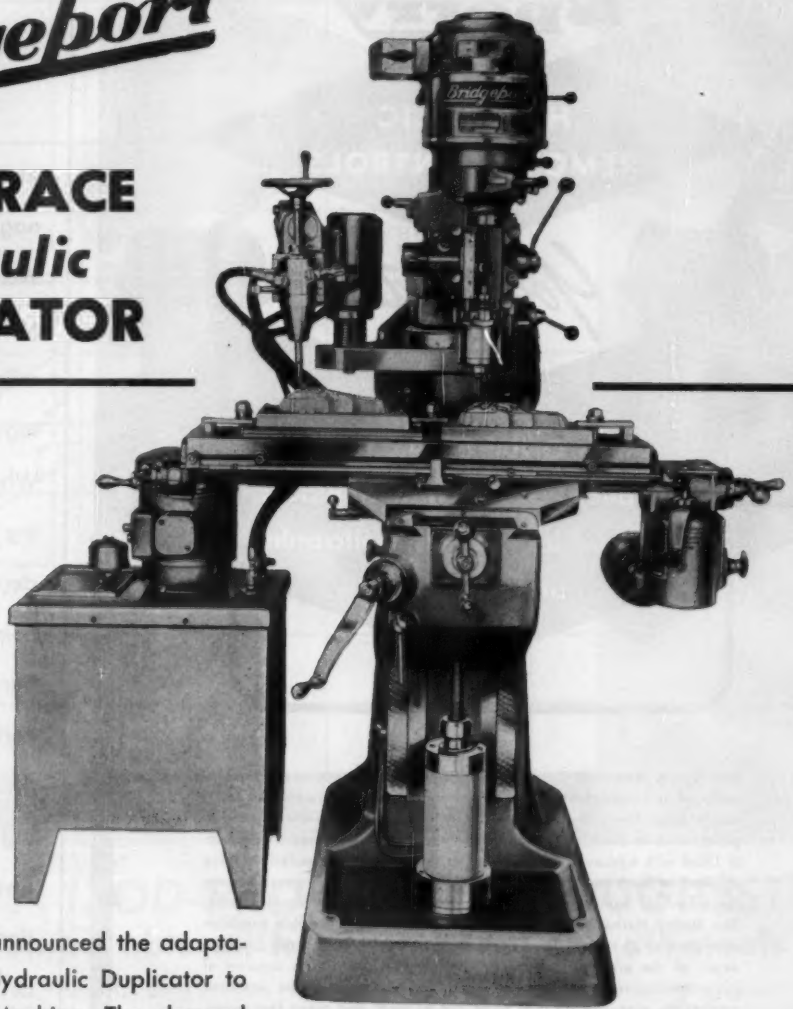
RIVETERS — PIONEERS in their line — head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method — Sizes to meet all needs — Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

The Bridgeport

TRUE TRACE *Hydraulic* DUPLICATOR



Twelve months ago we announced the adaptation of the True Trace Hydraulic Duplicator to the Bridgeport Milling Machine. The demand and the favorable comments on the performance of this equipment during the past year have exceeded our most optimistic expectations.

The Bridgeport True Trace combination will give excellent performance and save endless hours when copying irregular dies and moulds.

The stylus mounting fits between the column and the turret and is suitable for either right hand or left hand installation on new or old machines.

The stylus assembly swings out of the way so there is no interference when the machine is used for conventional milling.

Full details on request

Bridgeport MACHINES, INC.

Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines

The Sperry Hydraulic Control, a self-contained system, consists essentially of a hand-actuated transmitter and a receiver connected by a single tube. There is absolutely no dependency on outside sources of power such as electricity or air which are subject to failures. The system is filled with hydraulic oil, and due to the oil's incompressibility, force applied to the transmitter is immediately delivered to the receiver. Any movement of transmitter handle is duplicated by the receiver lever. The Sperry Hydraulic Remote Control System makes possible precision operation of a remote mechanism, free of backlash and the "sponginess" of the ordinary pneumatic control. The operator is assured of instantaneous response, extreme accuracy and "feel" of the operated mechanism even though it is often out of sight and many feet away. Simple and inexpensive installation complete the features appreciated by all in industry.

SPERRY HYDRAULIC CONTROLS are for manual or automatic control of:

Brakes	Hydraulic Pumps	Fire Extinguishers
Clutches	Hydraulic Reverse Gears	Feed Mechanisms
Throttles	Engine Spark Adjustments	Grinder Spindles
Governors	Engine Mixture Setting	Trippers
Valves	Variable Speed Transmissions	Releases
Rheostats	Hydraulic Transmissions	Duplication of Motions and many others

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DANBURY, CONNECTICUT

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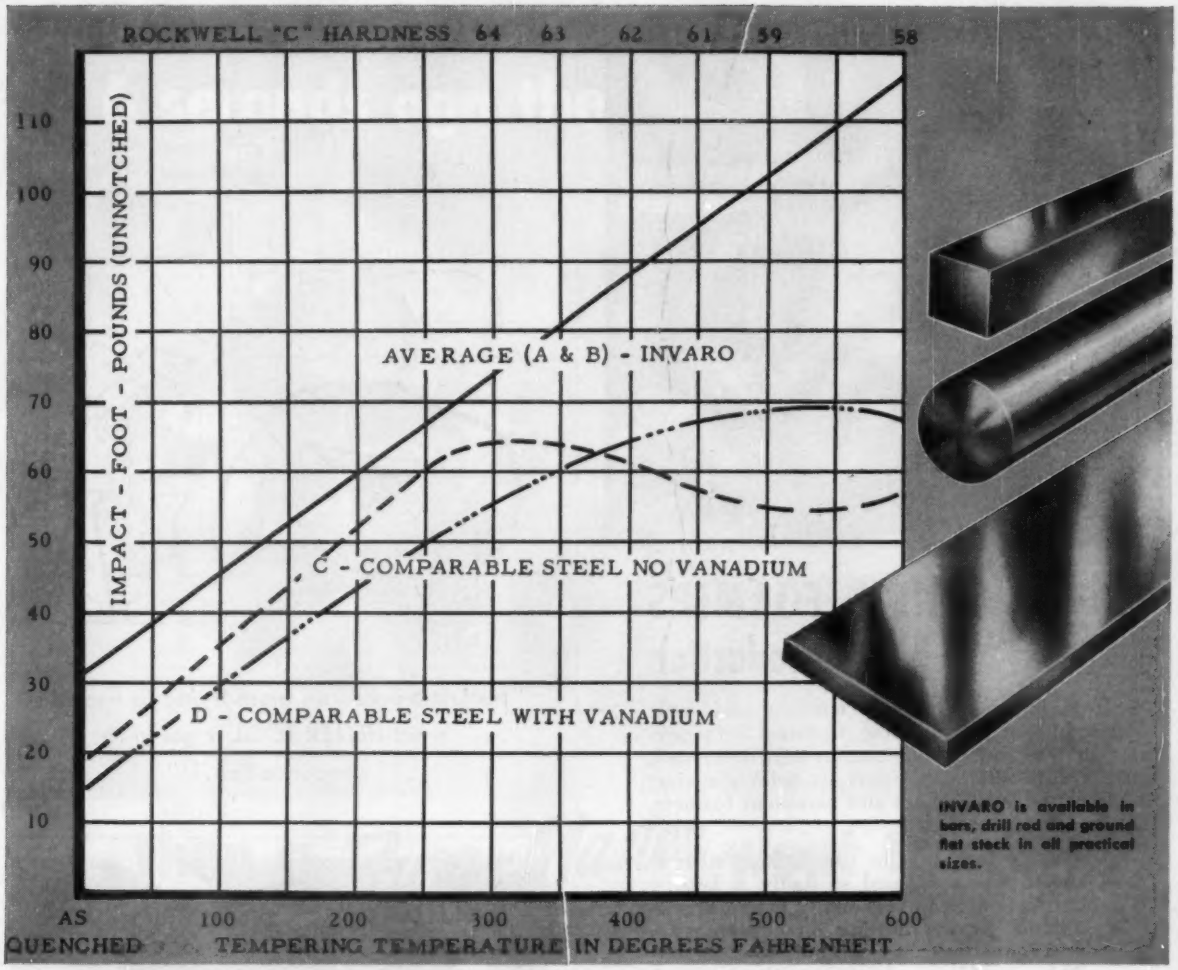

INVARO . . . *IZOD-PROVED* THE TOUGHEST
of leading comparable oil-hardening tool and die steels

When the toughness of a tool and die steel is the critical factor of selection, Firth Sterling INVARO is the *toughest* of the tough! That's not just an opinion but a *fact.* Undeniable proof is established by the A.S.T.M. Izod Impact Test, results of which are graphically shown above, comparing steels both with and without vanadium.

INVARO shows a superior toughness in *all* ranges of temperature from a minimum advantage of about 12% to as much as 100% greater! This marked superiority is the result of Firth Sterling's advanced metallurgical practices combined with 67 years of experience in the art of making specialty steels.

Yes, when you want *toughness* in your tools and dies, combined with uniformity, excellent hardening properties and safety in heat treating . . . specify INVARO.

Chemical Analysis	*All test samples were machined from half-inch annealed bar stock.*							
	C	Si	Mn	S	P	W	V	Cr
Invaro A	.88	.34	1.22	.010	.020	.49	.19	.50
Invaro B	.94	.25	1.20	.014	.013	.53	.22	.49
Comp. C	.90	.33	1.24	.011	.025	.50	—	.55
Comp. D	.95	.34	1.27	.010	.020	.50	.21	.59

Firth Sterling

R-320

—INC—

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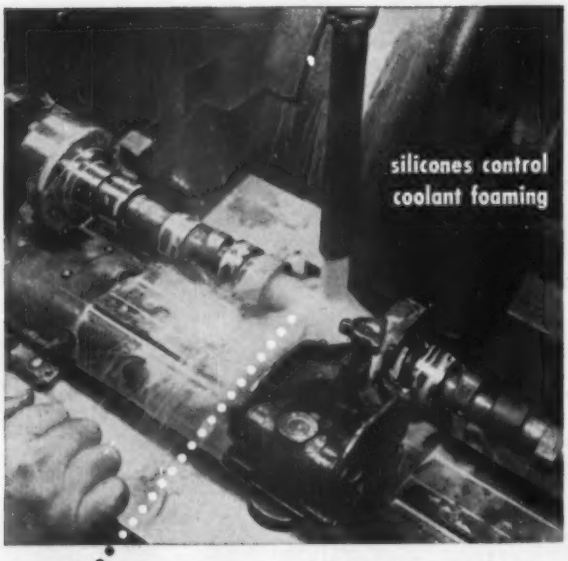
Zirconium



* SILICONE DEFOAMERS boost production

If excessive foaming is handicapping your production, try a Dow Corning defoamer. The most versatile defoamers ever developed, these silicone foam killers act quickly against even the most violent and persistent foamers. For example:

The coolant in the camshaft grinder shown above foamed so badly it kept output low and occasionally halted production by overflowing on equipment and floors in the surrounding work area. This costly production - maintenance problem was eventually solved by simply adding a single teaspoonful of Dow Corning Antifoam A Emulsion to the grinder's 300 gallons of coolant. That's less than 2 parts per million!

Now available . . . Metalworkers everywhere already acclaim Dow Corning's new *Antifoam B* the most convenient and economical defoamer for coolants ever developed! No pre-mixing, no agitating, it stays dispersed indefinitely.

Learn how to kill foam economically and boost your production.

DOW CORNING SILICONES

Write for FREE SAMPLE AND LITERATURE

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Please send me free information and sample of Antifoam B.

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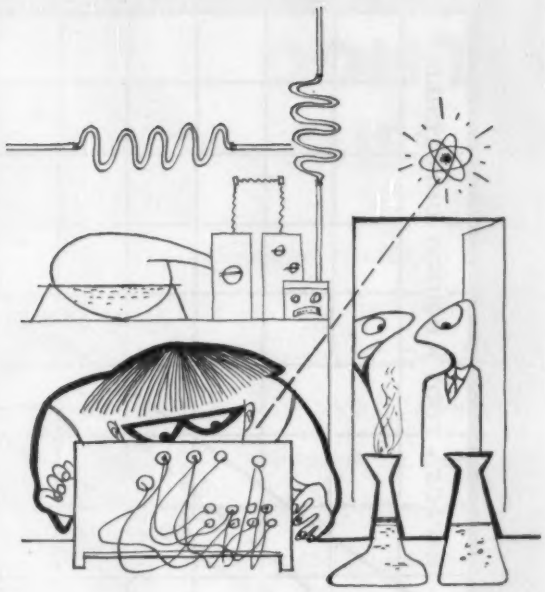


"He just cracked an atom trying to find out what HELLER TOOL is going to announce Feb. 1!"

A NEW NAME FOR AN OLD ESTABLISHED PRODUCT

In the interests of standardization the line of ACME Tangent Chasers have been modified slightly in dimensions so that they now are adaptable to other makes of die heads in addition to ACME die heads.

This complete line of tangent chasers is now known as "HILLCO". "HILLCO" tangent chasers can be reground for 80% of their original length. The same precision and long wear are guaranteed that have made our chasers a standard through 75 years of cutting tool manufacture.

THE HILL ACME COMPANY

ACME MACHINERY DIVISION

1203 West 65th Street • Cleveland 2, Ohio

6 seconds ago they were the same

. . . then a *Burr-Master* went to work

New Burr-Master Duplex 2-station machine. Available in two size ranges, also single-station model. All with Modern's quick-change tooling. Deburrs and chamfers gears from .625" to 6.5" p.d. and 3.0" to 9.5" p.d.

When gears have to be smooth and quiet in operation, complete deburring and chamfering is necessary. Burr-Masters cut away the burr and chamfer the edges and root of every tooth completely with a fast, accurate generated cutting action.

Burr-Master production rates average 5 teeth per second deburring and chamfering gears or splines, internal or external teeth, spur or helical tooth form. Time to completely finish the 26-tooth transmission gear above is less than 6 seconds.

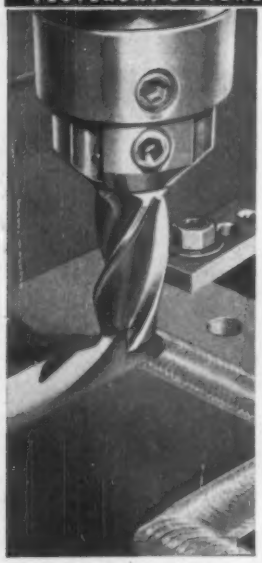
Even faster production is possible with the new Burr-Master Duplexes, which finish both sides of the teeth at the same time—at the same rates.

Bulletin BM-1 should help you on all problems of deburring and chamfering gears or splines. Ask for it.

14230 BIRWOOD AVE. **MODERN®** DETROIT 38, MICHIGAN

Industrial Engineering Co.

YESTERDAY'S PIONEER . . . TODAY'S LEADER



HEAVY DUTY END MILLS and HOLDERS

(Both are Stock Items)

● Look at this rugged 2″ diameter Weldon end mill with 4″ long flutes which made a 2½″ deep cut in a solid block of die steel—4140 steel heat treated to 260 Brinnell. The feed was 1½″ per minute, and the material was removed at a rate of 7½ cubic inches per minute.

This HEAVY DUTY Weldon end mill is held by a new-style end mill holder which bolts securely on to the nose of the milling machine spindle. The holder, located by a centering plug, is driven by two drive keys on the spindle nose. The 2″ diameter shanks of these heavy-duty end mills are securely held by two large hollow head screws.

For top performance and sturdy long life in end mills—large or small—look to Weldon.

Weldon distributors throughout U.S.A. and Canada carry complete stocks to serve you.

SEND FOR LATEST CATALOG NO. 11

THE WELDON TOOL COMPANY

3000 WOODHILL ROAD . . . CLEVELAND 4, OHIO

"And now for $64,000 . . . what's HELLER TOOL going to announce Feb. 1?"

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1 in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

H&G Insert Chaser DIE HEADS

famous for accuracy and straightness of threads, low chaser costs, less downtime, more pieces per day.

THE EASTERN MACHINE SCREW CORP., 20-40 Barclay St., New Haven, Conn.
Pacific Coast Rep: *A. C. Berhringer, Inc., 324 N. San Pedro St., Los Angeles, Calif.* Canada: *F. F. Barber Machinery Co., Toronto, Can.*

ALEXANDER

DEEP THROAT ENGRAVER does . . .

Precise, two-dimensional work. It handles workpieces up to 10″ high, 38″ wide, on a worktable 20x8″; optional auxiliary table 18x24″. Ratios—1:1 to 1:50. Spindle has fine and coarse feed adjustments. Cutters up to ¼″ dia. Speeds—2800 to 15,000 rpm. ¼ hp motor.

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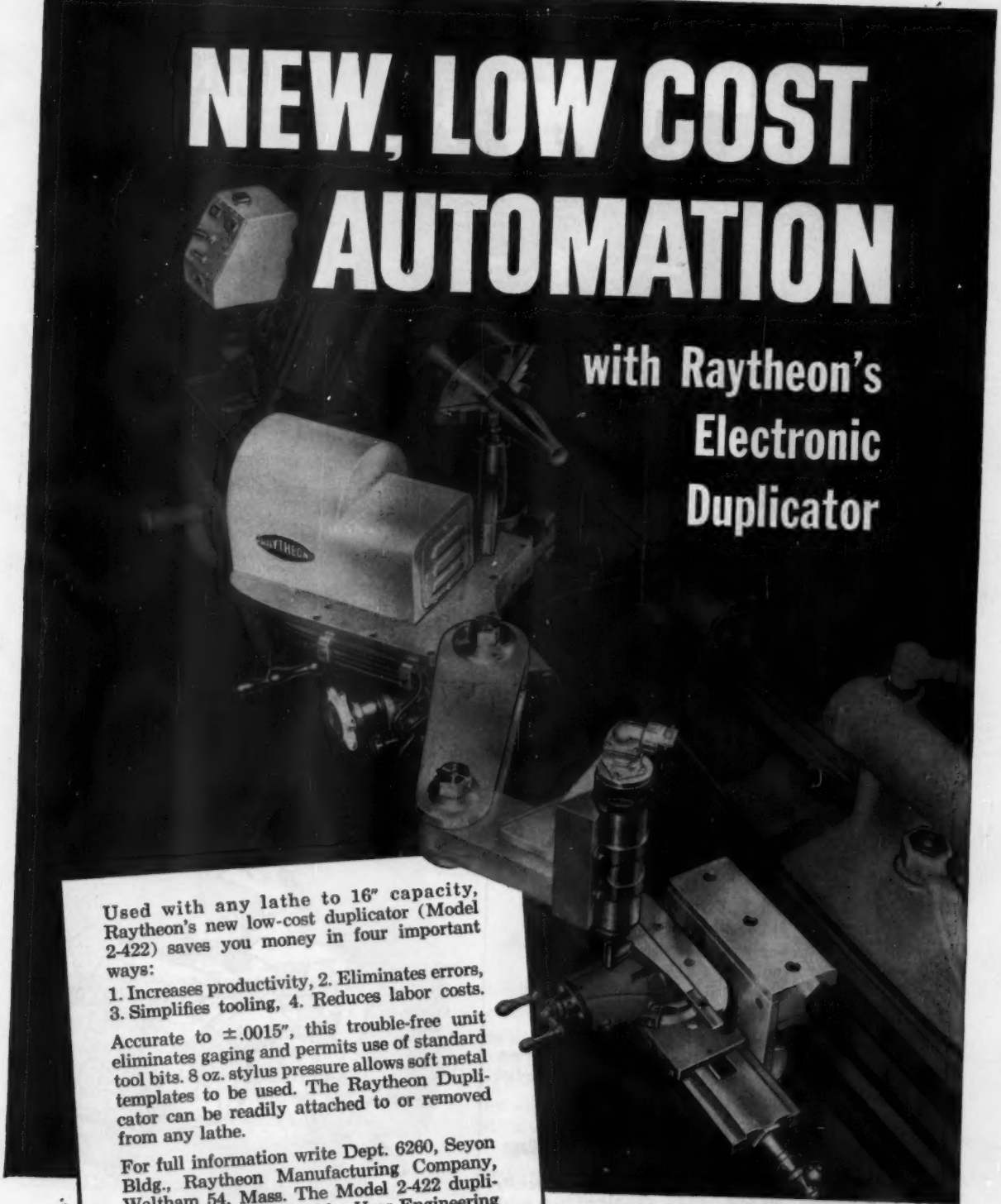
J. ARTHUR DEAKIN & SON

150-28 Hillside Ave., Jamaica 32, N. Y.

NEW, LOW COST AUTOMATION

with Raytheon's Electronic Duplicator



Used with any lathe to 16" capacity, Raytheon's new low-cost duplicator (Model 2-422) saves you money in four important ways:

1. Increases productivity, 2. Eliminates errors, 3. Simplifies tooling, 4. Reduces labor costs.

Accurate to ±.0015", this trouble-free unit eliminates gaging and permits use of standard tool bits. 8 oz. stylus pressure allows soft metal templates to be used. The Raytheon Duplicator can be readily attached to or removed from any lathe.

For full information write Dept. 6260, Seyon Bldg., Raytheon Manufacturing Company, Waltham 54, Mass. The Model 2-422 duplicator is also distributed by Voss Engineering Company, Pittsburgh 8, Pa.

RAYTHEON

RAYTHEON MANUFACTURING COMPANY

Equipment Marketing Division, Waltham 54, Mass.

Excellence in Electronics

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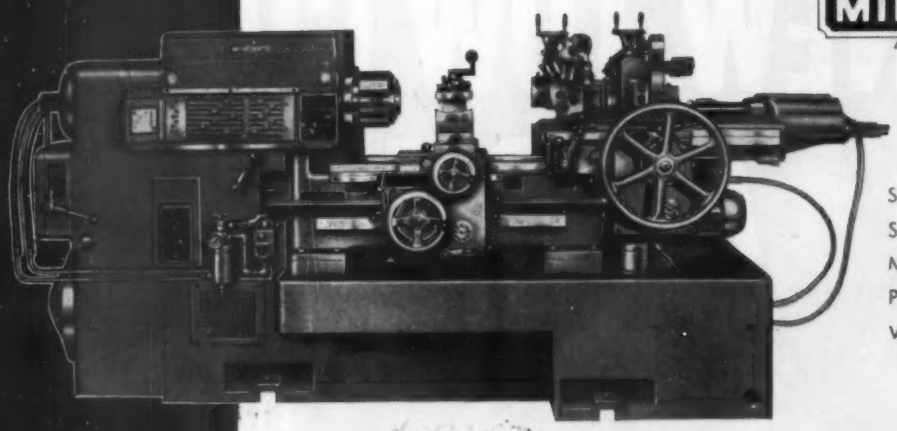
MINGANTI
BOLOGNA



Spindle bore 2 1/4"
Swing 18"
Max speed rpm 3000
Power HP 8
Weight lbs. 6000

AUTOMATIC
"CAMLESS"
TURRET LATHE

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Exclusive Distributors for the U.S.A.: Sales Service Parts
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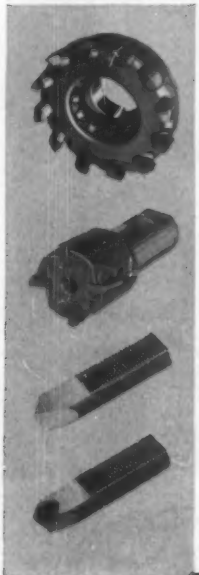
Look into the complete, cost-cutting **LOVEJOY** *line. Standard tools are* ***in stock*** *– to help you increase production, save time and money* ***now!***



INSERTED-TOOTH MILLING CUTTERS
Face, side, end, slotting and boring mills.

H. S. S., CARBIDE, ALLOY BLADES
Interchangeable in all Type "A" milling cutters from 4½" to 24" in diameter.

NEW! SET-SCREW TYPE END MILLS
And new Type "Z" slotting cutters provide maximum axial and radial adjustment.

Boring Tools • Arbors • Flywheels
Lovejoy Milling Cutter • Assembly Gage

Special cutters are a Lovejoy specialty
Write for new catalogs: No. 31 (Face Mills), No. 32 (Side Mills), No. 33 (Arbors).

141 MAIN ST., SPRINGFIELD, VERMONT

Send for free **SPEED & FEED CALCULATOR**

LOVEJOY TOOL COMPANY, INC. Ltc
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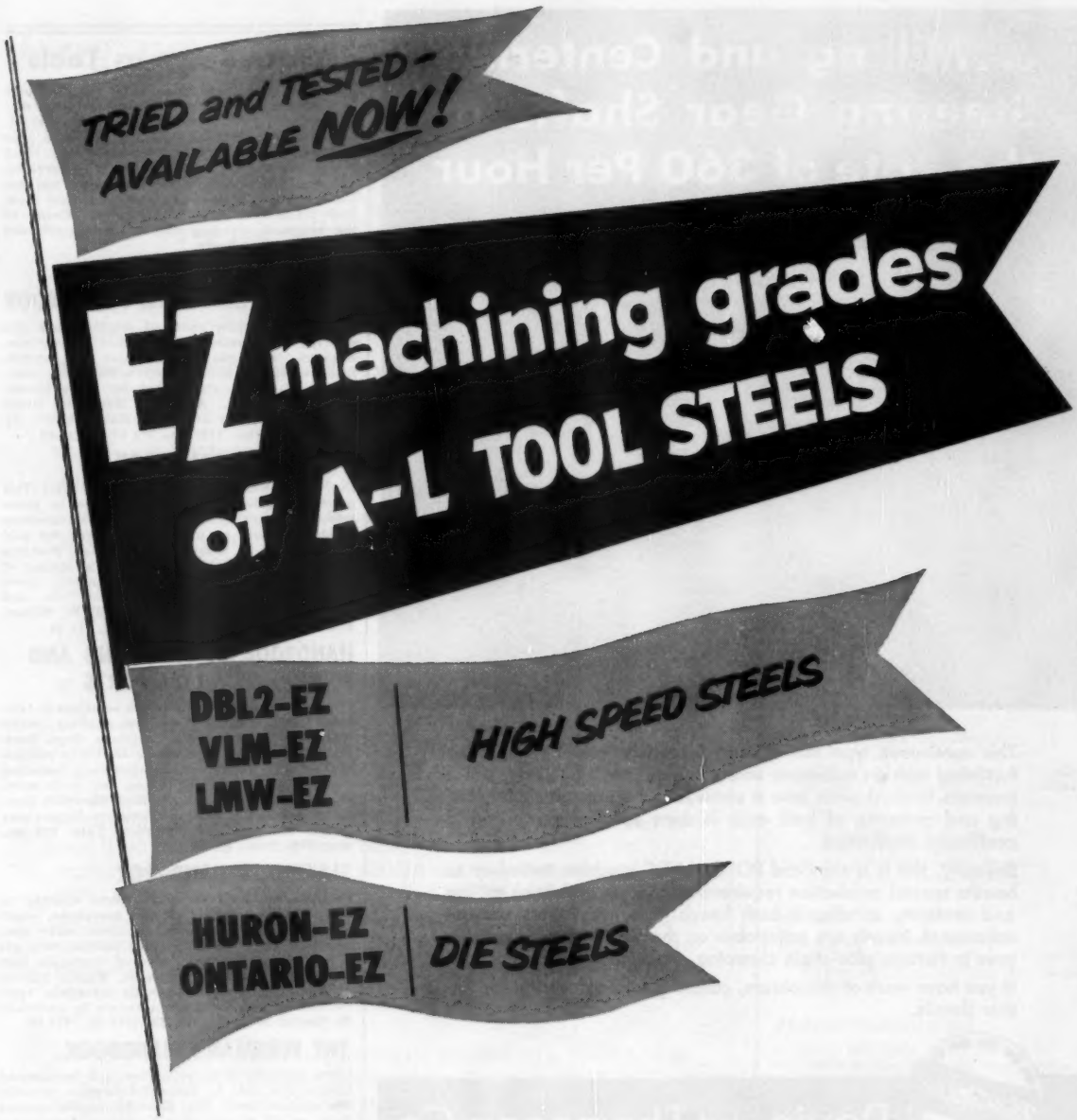
"Never mind his left hook — watch out for what HELLER TOOL is going to announce Feb. 1!"



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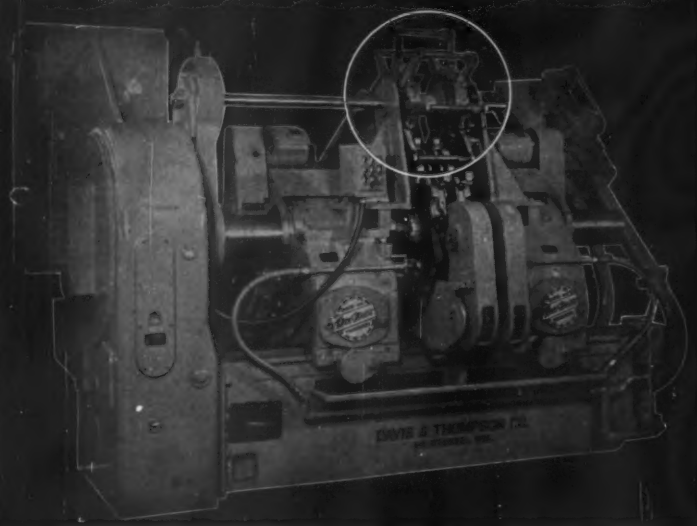

This continuous type milling and centering machine has been furnished with an automatic unloader (indicated by circle) which transfers finished parts onto a conveyor or discharge chute. Milling and centering of both ends is done simultaneously and in continuous production.

Basically, this is a standard ROTO-MATIC machine tooled-up to handle special production requirements. Rough and finish milling and centering spindles in both heads have micrometer endwise adjustment. Heads are adjustable on the ways. With equalizing jaws in fixtures plus chain clamping, machine is fully automatic.

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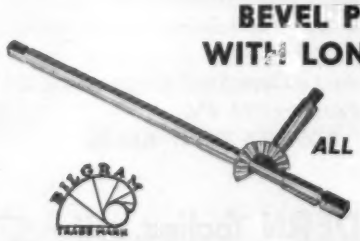

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Gaging . . .

the Surplus Machinery Market

As we go into what looks like a banner year for the used machinery business—a year that may be tempered somewhat by tightening credit restrictions and the increasing difficulty of obtaining top-quality surplus machines for resale—it might be well to look at what is being done to solve many of the industry's most pressing problems.

To find out, we talked with Randy Vinson, executive director of the Machinery Dealers National Association, which has become a spokesman for dealers across the nation.

This is what MDNA has on its agenda for the coming year—you might call them the industry's New Year Resolutions:

- **Accelerated depreciation for used machinery:** MDNA is working hard on this problem, has already requested that the buyer of surplus machinery be put into a more fair and equitable competitive position with the purchaser of new equipment, in a formal presentation before the Joint Committee (of Congress) on Taxation, and the Treasury Department. MDNA is hopeful that provisions for faster writeoffs of used machinery will be written in the House Ways & Means Committee's 1957 Report.

- **Government bid procedures:** today, when the government gets a sealed bid and a deposit from dealers and from metalworking plants on its surplus machine tools, it is (1) slow to advise that a bid has been accepted, (2) slow to return deposit money on an unsuccessful bid; and (3) if a dealer bids on three machines and gets one, it often takes a long time before his deposit money for unaccepted bids is returned to him. MDNA has talked the problem over with government officials, asking that paperwork procedures be simplified and speeded up to eliminate the tying-up of large amounts of dealer capital. It has suggested that both the government and the dealer would profit if the government were to accept bid bonds or letters of credit. There is a good chance this will be done by 1957's end.

- **Inspection clearing house:** within its membership, MDNA is setting up a nationwide network whereby a dealer on the East Coast, for instance, can have a fellow dealer on the West Coast inspect a machine in a nearby plant for him. This would mean a marked savings in railroad fares, phone calls, etc.

- **Packaging and shipping:** This year, the Association is experimenting with the development of either plastic or paper machine covers as a standard for the industry. They will be throwaways, will protect against bad weather, dirt, etc.

- **Financing used machinery purchases:** This is one of the knottiest problems facing the dealer today, and the Association is discussing ways and means of achieving more equitable terms with commercial finance houses, banks, and other sources.

- **Industry barometer:** MDNA's statisticians, Ernst & Ernst report they expect to have a quarterly percentage increase or decrease chart ready for publication sometime this year.

- **Terminology:** Standard terms and definitions (such as "first refusal," "FOB," etc) will be published by the Association this year—to avoid dealer-buyer confusion resulting from local usage and from train and truck shipping terminology.

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AUTOMATICS
B & S OG Vert. Slide, Swing Stop—Magazine Feed
CLEVELAND Model A 1-1/16" Single Spindle
B & S OOG Screw Threader, Vertical Slide

CYLINDRICAL GRINDERS
NORTON 14" x 36" Type C Plain—1942
CINN. 6" x 18" Model ER Semi-Auto.—Filmatic
NORTON 6" x 30" Type C Hydr. Plain
B & S #2 14 x 30 Univ.
B & S #1 10 x 20 Univ.

SURFACE GRINDERS
COVEL #20 6" x 18" Hor. Hydr.
NORTON 6" x 18" Hor. Hydr.
NORTON 6" x 18" Vert. Hydr.
HILL-ACME 18" x 72" Vert. Hydr.

ENGINE LATHES
AMERICAN 36" x 60" High Duty—1940
REED PRENTICE 20" x 78" 16-Speed
AMERICAN 12" x 30" High Duty

TURRET LATHES
B & O #7 2½" Ram Chucking
GISHOLT #4 2" Bar or Chucker
GISHOLT #3 1½" Ram, Bar or Chucker
GISHOLT #5 2½" Ram, Bar or Chucker
GISHOLT 2L 3½" Saddle—Taper—Threading
W & S #2 1" Ram, El. Bar
W & S #3 1½" Ram—Chucker
W & S #4 2" Ram—Bar—Preselect
W & S #5 2½" Ram—Bar—Preselect

MILLERS
B & S 2B Hi-Speed Plain
K & T 3H Vert., Power Feed to Head
VAN NORMAN #22LU Univ. Div. Heads
VAN NORMAN #22L Plain

PRODUCTION MILLERS
CINN. #08 Plain
CINN. #4-36 Hydromatic, 2-way cycle
K & T 18-54 Simplex
CINN. #2-24 Plain

INJECTION MOULDERS
FELLOWS 1B-15 3-oz.—1951
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MOREY 12" Vertical
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FELLOWS No. 6 gear shaper; M.D. late
FELLOWS No. 61A High Speed Gear Shaper; cap. 18" late type
FELLOWS No. 622 High Speed Gear Shaper; late
FELLOWS No. 612 High Speed Gear Shaper; late
FELLOWS No. 624A High Speed Gear Shaper; late
FELLOWS No. 645-A Gear Shaper; late type
FELLOWS type 645-AS High Speed Gear Shaper
FELLOWS No. 7 High Speed Gear Shaper; late
FELLOWS No. 7A High Speed Gear Shaper; late
FELLOWS No. 72 High Speed Gear Shaper; late
FELLOWS No. 73 High Speed Gear Shaper; late
FELLOWS No. 715 High Speed Gear Shaper; late
FELLOWS No. 7125 High Speed Gear Shaper; late
FELLOWS No. 77 Gear Shaper; late type
FELLOWS No. 13LS Lapper; late type
FELLOWS 4-T Thread Generator; 4"x12" late
FELLOWS #24 Involute Measuring Machine; late

GEAR EQUIPMENT—Gleason

GLEASON No. 1 Flame Hardener; late type
GLEASON 3" Straight Bevel Gear Gen. late
GLEASON No. 6 Revacycle; late type

LANDIS 10" x 96" type C Plain Hydraulic Grinder.

GLEASON No. 12 Tool Sharpener; late
GLEASON 12" Straight Bevel Generator; for Roughing & Finishing; late type
GLEASON No. 12 Straight bevel gear Rougher; M.D., late type
GLEASON No. 12B "Coniflex" Gear Generator
GLEASON 12" Spiral Bev. Cutter Sharpener; M.D.
GLEASON 15" spiral bevel, cutter sharpener; M.D.
GLEASON No. 14 Spiral & Bevel Hypoid Gear Grinder; M.D.
GLEASON 13" Spiral Bevel Finisher
GLEASON No. 15 Quenching Press; late
GLEASON 25" Quenching Press; late type
GLEASON No. 18 Gear Tester & Lapper; M.D.
GLEASON 24" Bevel Gear Planer; M.D.
GLEASON 52" Straight Bevel Gear Planer
GLEASON 54" Spur & Straight Bevel Gear Planer

GRINDERS—SURFACE

BILLITER & KLUNZ 48"x186" Way Grinder
BLANCHARD No. 11 Rotary; cap. 36" dia. M.D.
BROWN & SHARPE No. 2; motor drive; late
BROWN & SHARPE No. 2; NEW
HANCHETT 30"x120" Wheel Grinder; late
HEALD No. 22 Rotary; 12" chuck; M.D.
HEALD No. 25A Rotary; 30" Chuck; late
MATTISON 14"x10"x60" Hydraulic Surface
MATTISON 14"x24"x72" Rotary late type
MATTISON 16"x24"x120" High Power; late
NORTON 6"x18" Vertical and Horizontal; l
PRATT & WHITNEY "B" 14"x36" Vert.;

LATHES—Turret

GISHOLT 1L Univ. Saddle type; Timken;
GISHOLT 2L Univ. Timken; late type
GISHOLT No. 3 Univ. M.D.; late type
GISHOLT No. 5 pro-selector head; late
LIBBY 4H-12; 12" hole; M.D.; late type
MOREY No. 2 ram type, Timken; latest type
MOREY No. 4 Univ. ram type; latest type
WARNER & SWASEY No. 1 Electric; late
WARNER & SWASEY No. 1A Universal; for chucking work
WARNER & SWASEY No. 2A Universal, for chucking; M.D.; late type
WARNER & SWASEY No. 4 Univ., pro-selector head; late type

MILLING MACHINES

BROWN & SHARPE No. 2 "Light Type," PRT Timken; late type
BROWN & SHARPE No. 12 electrically controlled; late type
CINCINNATI 2-24 Automatic; Timken; M.D.
CINCINNATI 2-36 Hydr. rise and fall; Timken
CINCINNATI No. 4 High Power, Dial Type; High Speed; M.D.; New 1952
CINCINNATI No. 5-48 tracer controlled; Hydr.
KEARNEY & TRECKER (Milwaukee) No. 2H; Timken Bearing; late type
ROCKFORD No. 3 "Rigidmill"; motor drive
STARR No. 2 Table 13"x55", late type
SUNDSTRAND No. 33 Plain; late type

MILLING MACHINES—Vertical

BROWN & SHARPE No. 2 Light Type Vert.
CINCINNATI 0-8 Vertical, Timken; late
CINCINNATI No. 2M Vertical; late type
CINCINNATI No. 3; dial type; high speed or medium speed; Timken; late type
KEARNEY & TRECKER (Milwaukee) Model CSM high speed; Timken; power rapid traverse
REED PRENTICE No. 5 PRT; Timken; late

PLANERS

GRAY 48" x 48" x 10' "Maximum Service"; 4 heads; Power Rapid Traverse; D.C. Reversing
LIBERTY 144"x78"x48" adj. openside; 1 table; 4 hds.; vari-voltage; Power Rapid Traverse; M.D.; late type; NEW 1940
NILES 48"x48"x10' double 4 hds., PRT M.D.
NILES BEMENT POND 72"x72"x30'; 4 hds.; Power Rapid Traverse; D.C.; M.D.
NILES BEMENT POND 60"x60"x14' doube housing; late type
SELLERS 48"x48"x14' Double Housing; late type
SOUTHWARK No. 1; 10' Plate Edge Planer

PRESSES

BESCO Model M18; OBI; cap. 10 tons; new
BESCO Model EB2, 18½-ton Bank Flywheel New
BIRDSBORO 325-ton, 31"x31" bot. uprights
BLISS No. 410A, 525-ton double action toggle drawings press; M.D.
NATIONAL No. 5 "Maxi-Press" 1,000 ton cap., H.S. Forging Machine; M.D.
NIAGARA No. 66E, 35-ton Press; late
V & O No. 3 30-ton O.B.I. Press; late
WATERBURY FARREL No. 9, 125-ton cap. Blanking Press; M.D.

CASH
· CREDIT
· RENTAL
· TRADE-IN

SCREW MACHINES—AUTOMATIC

ACME-GRIDLEY 2" RB 6-spindle Automatic Screw Machine; New 1953
CLEVELAND 3¼" model A single spindle
CONOMATIC 1⅞", 8-spindle; late type
CONOMATIC 4⅝", 4-spindle; late type
GREENLEE 1¾", 6-spindle; late type
GYROMATIC Model 40, 1" 6-spindle; late
NEW BRITAIN #836 Automatic Chucking Machine; late type

SHAPERS & SLOTTERS

CINCINNATI 20"; Heavy duty—horizontal; M.D.
CINCINNATI 24"; Heavy duty—horizontal; M.D.
CINCINNATI 24" Standard Duty Horizontal; late
GOULD & EBERHARDT 24"; Horizontal; M.D.
GOULD & EBERHARDT 32" "Invincible" Model horizontal; M.D.
HENDEY 12" Universal Horizontal; High Speed
ATLAS 7" Shaper; length of ram stroke ½" to 7"
MANVILLE #1 Auto. Screw Slotting cap. 3/16" dia., 1¼" length; M.D.
MOREY 8" Vertical Shaper; late type
MUIR 6" Vertical Shaper
NEWTON 15" Vertical Slotter; M.D.
PRATT & WHITNEY 6" Vertical Shaper Model B
PRATT & WHITNEY 10" Vertical Shaper; M.D.
ROCKFORD 28" Hydraulic Horizontal; late type
ROCKFORD 36" Openside—Hydraulic 2 heads; late
STEPTOE 14" Horizontal; M.D.

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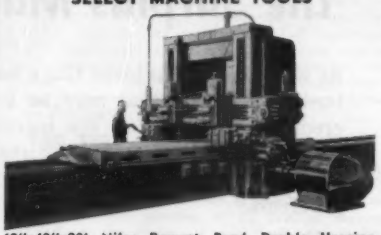

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*16A2 Blanchard 2 spdl. Autom. Surf. '48
*72A Heald Intern. T.R. Mod., Cr. Feed Head & T. Stock '42 Rebuilt Cond.
*10x36 Landis Ext. w/plunge Ser. 26601 Rebuilt
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KELLER

*BL3620 P&W Keller, 3 Spdl. 3 Dim. Exs. Cond.

LAPPERS

*Cinc. Centerless Lapper, Filmatic '51, like new.

LATHES

*20x84 Sidney H.D. 32 speed T.R. Mod. '52
*8 Sundstrand Autom., F.&R. Slides, T. stock '42
*8A Sundstrand 12" swing with F.&R. Slides '52 mod.
*8x21 Fay Autom. w/F.&R. Slides '44
#3 W&S Univ. Turret, 12 speed Ser #448293—'37
*4A W&S Turret, C. Feed Turret Ser #674060

MILLS

*2H K & T Vert., Mier. Stops, 5 HP, '42
*#2 B & S Plain Horiz. w/v. head, 3 HP, '48
*0-8 Cinc. R&F Prod. 12" Feed (new)
*2-24 Cinc. Simplex, Prod. '50 mod.
*34-48 Cinc Hydromatic Simplex, w/Tracer
*CT 38 Less Bradner Univ. Thread Mill '44

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*200 Ton Rodgers Hydr. 30" str. 30x30 bed

SHAPER

*30" Rockford Open Side, S. & R. heads '43

SAW

*11x11 Peerless "Hydracut" Hack, 20' barfeed '46

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30" Blanchard No. 18 Vert. Rotary
36"x42" Pratt & Whitney Vert. Surf. '47
60" Hanchett Vert. Spin. Surf. No. 300, Rec. 16"x20" B. & S. No. 1 Univ. '42
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No. 2, 3, 4, 6 WARNER & SWASEY Univ. Turret Lathes, Bar Feed.

No. 2, 7 BARDONS & OLIVER Universal Turret Lathes, Preselector, Bar & Chucking. Late Type.

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No. 2HL Kearney & Trecker Horiz. Mill, M.D., Late Type.

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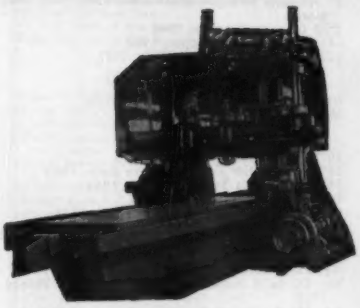

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42" by 36" x 12' INGERSOLL Planer Type Mill, two heads on rail, two side heads, M.D.

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No. 2, 3, 4, 5 CINCINNATI Hi Power Horiz. Mills, M.D.

PRESSES

No. 6 BLISS Straight Side Press Double Crank 135 Tons Cap., Motor Driven.

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4' x 12' LANDIS Hydraulic Plain Cylindrical Grinder, M.D. Late Type.

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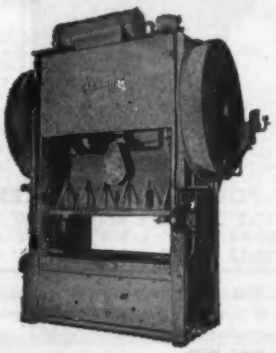

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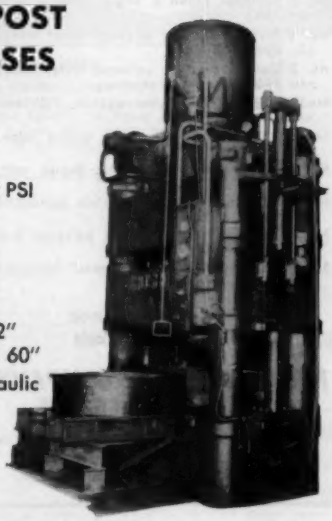

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5¼" Cleveland Model B, 1948
475 New Britain, 1945

BORING MACHINES

No. 49 Heald Boramatic, Single End, 1943
2112A Excello Single End 1943

BROACHES

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No. 3-54 LaPointe Vert. Hyd., Duplex, 1942
HP 100 LaPointe, 50 ton, 72", 1942
30 Ton, American Duplex Surface, 72" Stroke, Vert., 1943

DRILLS

No. 121 Baker, No. 4 M.T., 1942
No. 242 Barnes, 1942
3'-9" Cincinnati-Bickford, Late
4'-11" Cincinnati-Bickford Late

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No. 6 Gleason Revacycle Generator, 3 Spindle, 1940
No. 7 Gleason Revex, Rougher, 1942
3" Gleason Straight Bevel Generator, 1943 (like new)
#12 Gleason Rougher, 1942
61, 645A3 Fellows Shaper, 1942
6Z2 Fellows Shaper 35" Pitch, 1942

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No. 130 Cleveland Rigidhobber, 1942
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10"x18" Norton Type "C" 1941
14"x48" Norton Type C, Heavy Duty, 1941
16"x48" Landis Type "D" Hyd. 1943
16"x48" Olivetti New (1953)
No. 72A3 Heald Sizematic, Internal, 1945
No. 74 Heald Extended Bridge Gap, Internal, 1941 (like new)
No. 22 Heald Rotary 12" Chuck 1941
No. 25A Heald Rotary 16" Chuck Rotary, 1942
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2A Warney & Swasey Presselector 1942
2H-8 Libby Univ. Saddle 1943
No. 4H-12 Libby Saddle Type 12" Cap., 1943
No. 5H-12 Libby Saddle Type, 12" Cap., 1943
No. 3A Warner & Swasey Univ. Saddle, Threading, 1943
No. 4A Warner & Swasey Universal Saddle Cross Slide, 1944

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No. 5 Sant Andrea, 1953
No. 2-24 Cincinnati Hydromatic, Rise & Fall, 1942
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19"x10' bed LeBlond Geared Head, m.d.
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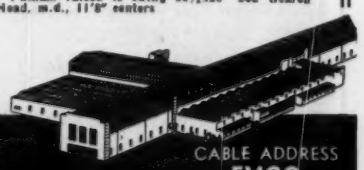

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3 spdl. 20" sw. #2LMS L-G, 1942
3 spdl. 24" sw. #3MS L G, new 1943
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#314-A Baker Univ. H.D., 1943
16 spdl. Fox #K60H, #2 taper, 1944

GRINDERS

2"x12" #5 B&S, 1942
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4"x12" #4H Landis, new 1942
6"x18" Norton Type C, new 1943
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10"x36" Norton Type C, new 1942
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16"-40"x96" Norton Gap, 1942
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16"-26"x72" Norton, AC MD 1941
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#16A-16 Bryant Internal, new 1943
#16-38 Bryant Internal, new 1941
#24-26 Bryant Internal, new 1941
#24-36 Bryant Internal, new 1941
#72A3 Heald Int. Sizematic, 1944
#72A5 Heald Internal, new 1942
#72A5 Heald Bridge Type Int.
#214 Besly Double End Disc. 1940
3B Abrasive Surf. 8"x24", 1943
#18-36" Blanchard Rot. Surf.

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12"x30" Hendey Lathe, Taper Att.
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24"x42" Fay Auto. AC MD
36"x120" Putnam Grd. Hd., MD
R14 Seneca Falls, 16"x36", 1942
120"x96" ce N-B-P, ser. 3380
#5W Cinn Acme Univ. Turret
#4 Gisholt Univ. Tur. A.C.&B.F.
#3H-10 Libby H.D. Tur. 1942
#4A W&S Turret Ser 238969
4FU Fastermatic, tur. 33"sw. 1944
8D Potter & Johnston, new 1941

MILLERS

54"x30"x16' Ingersoll Slab, 1934
54"x60"x8' Ingersoll Openside, 1942
54" Ingersoll Vertical Rotary
Davis & Thompson Vert. 1944
#12-B Pratt & Whitney Profilers
10"x60" P&W Mod. B. Thread Mill
#LT 6"x72" L B Thread Mill
#HT 12"x24" L-B Thread, 1942
#CT 24"x36" L-B Thread, 1942
No 2 Cinn. Univ. Hi-Power
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#306 Barnes Vert. Hone, new 1942
#11RD 2 Hd. W&S Tapper, latest
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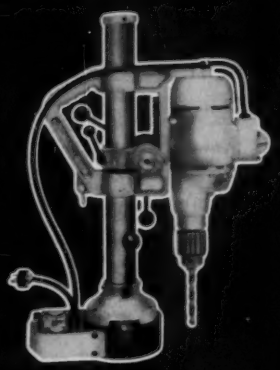

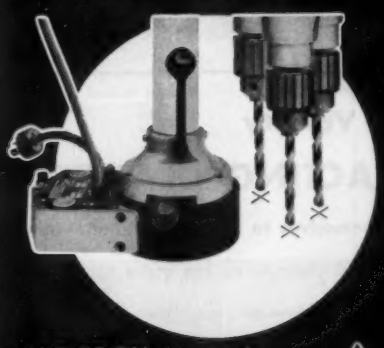

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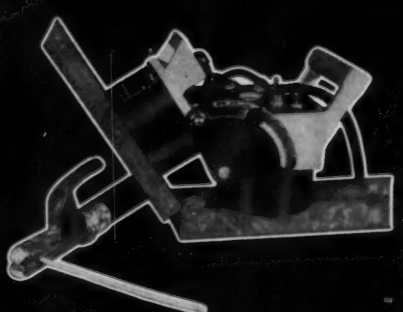

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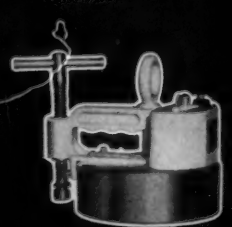

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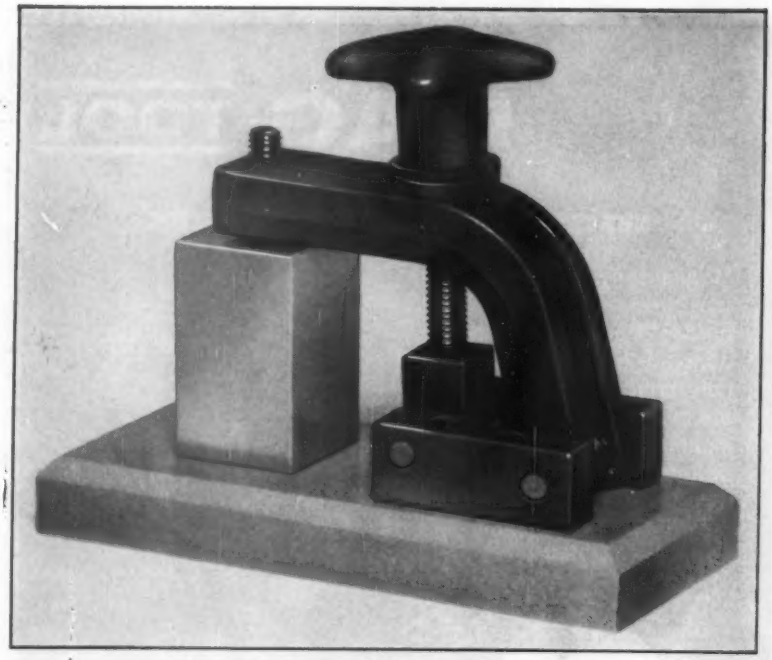

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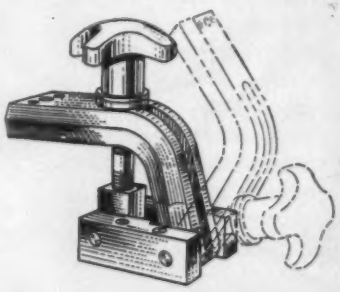

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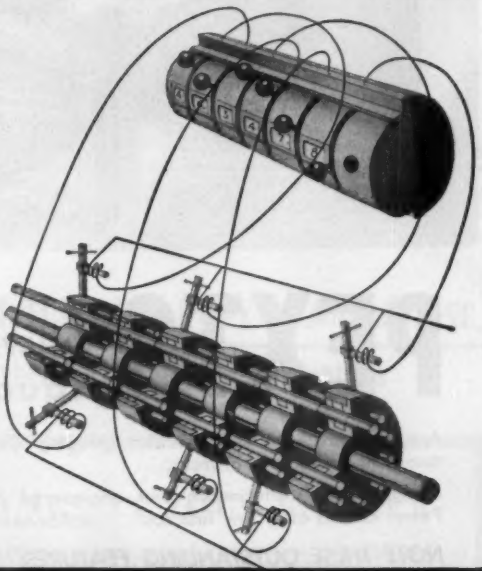

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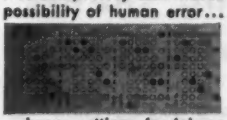

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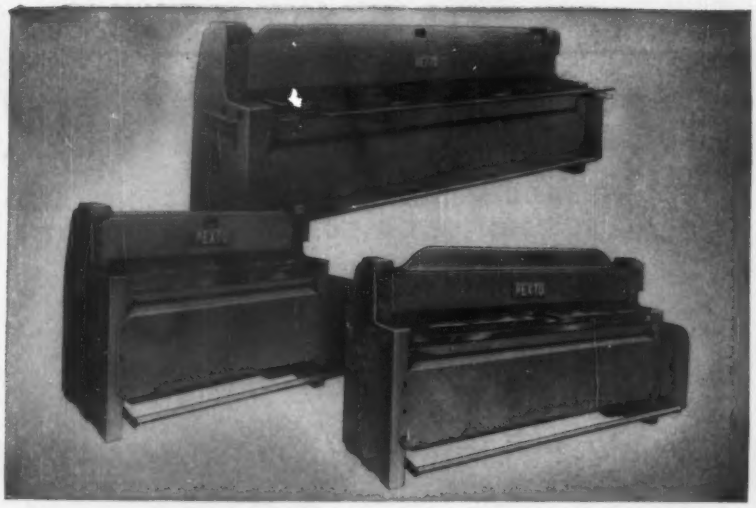

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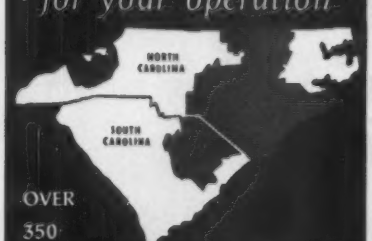

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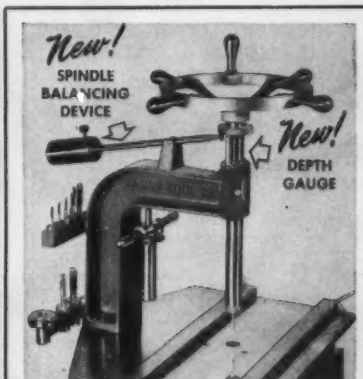

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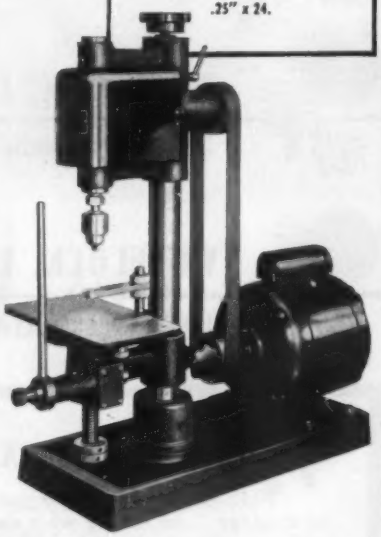

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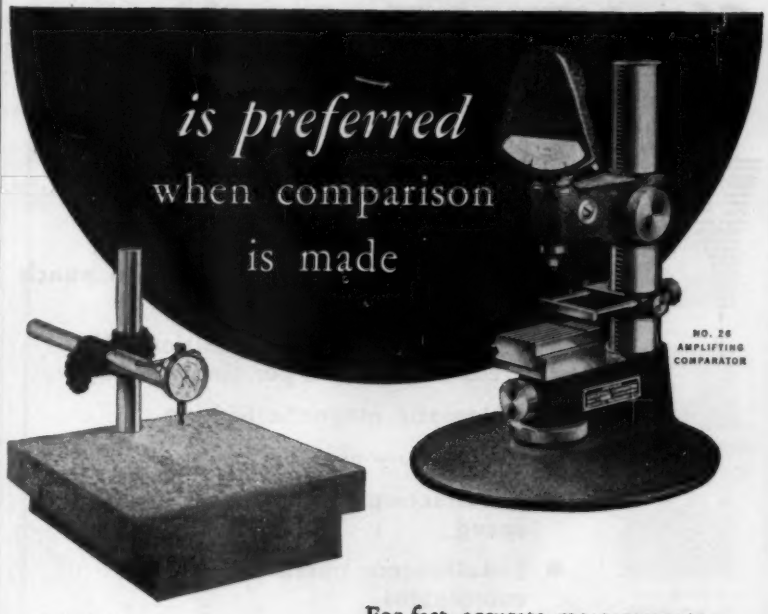

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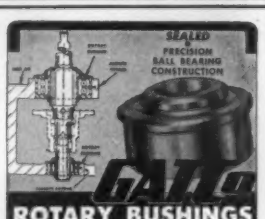

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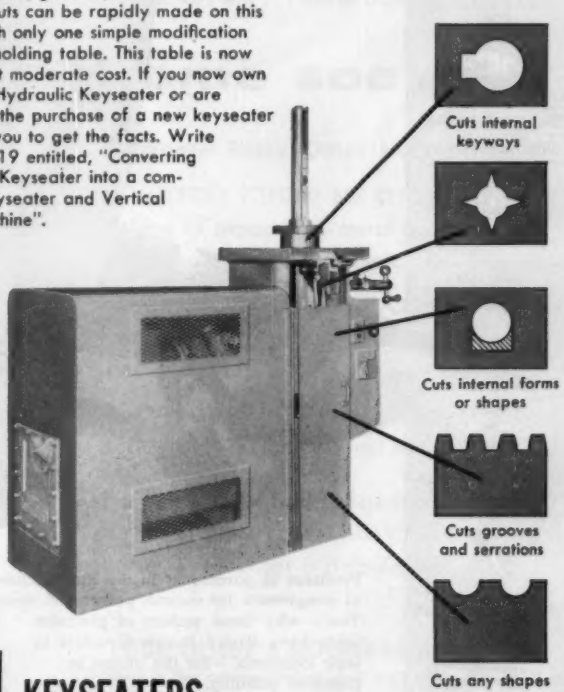

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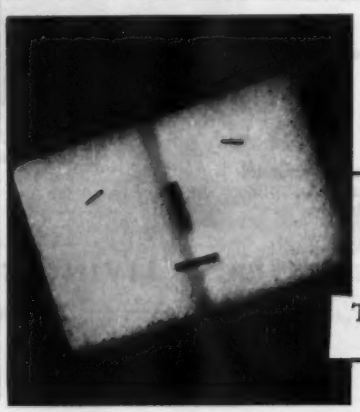

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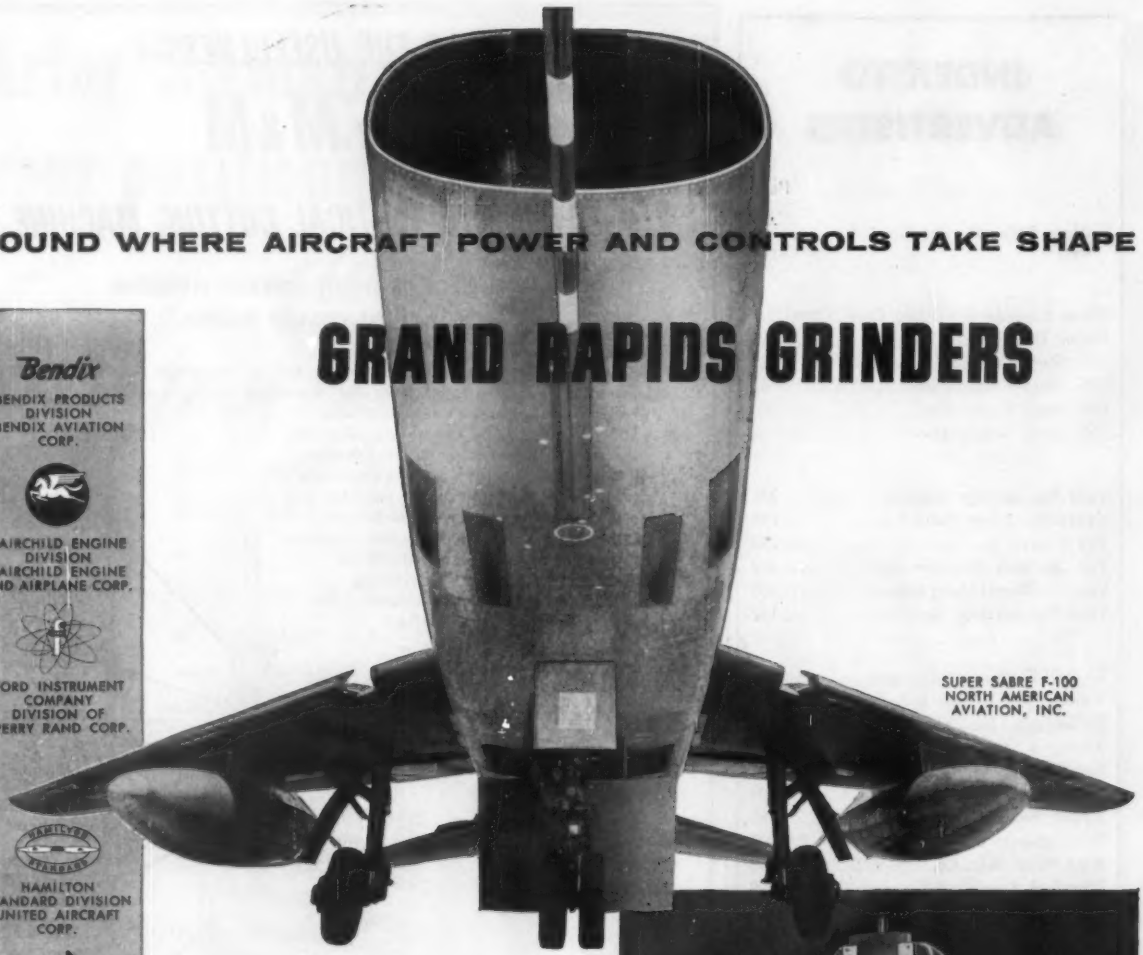

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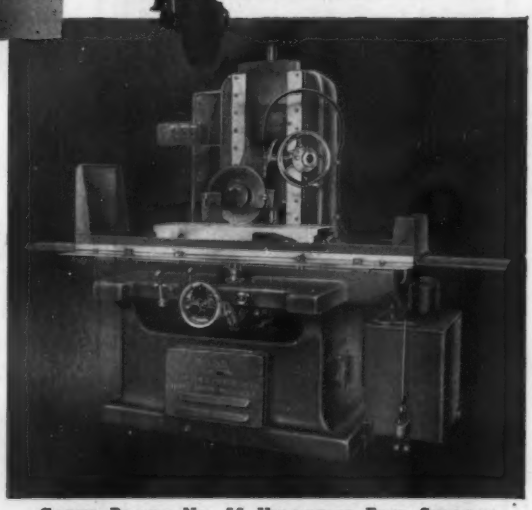

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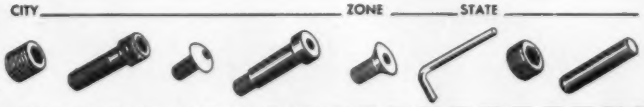

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